B. S. Naik

TYPOGRAPHY OF DEVANAGARI

Vol. II

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GOVERNMENT OF MAHARASHTRA

TYPOGRAPHY OF DEVANAGARI

Volume Two

by

Bapurao S. Naik

B A (HONS), M I PTG M (LON), F R S A (LON)

Fellow Indian Standards Institute

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Typography of Devanagari

(Volume Two—Parts III, IV & V)

PART THREE

Devanagari Setting, by Hand, Mechanical and Photo

(Chapters XII to XV)

CHAPTER XII

DEVANAGARI TYPE SETTING

256. From the method of consonant-vowel combination explained earlier, in part. I, it will be seen that the Devanagari script is actually *written* in three steps. It is set in type in two styles, one is called *Degree* System and the other *Akhand* System. In the *Degree* System the types are assembled in three steps. The half or full consonant in the middle on half body; the *mātrā* (ा), *velānti* (ं), *rafār* (र्) and *anuswār* (ं) on the top, on quarter body ; and the *ṛkār* (ृ), *ukār* (ु), some half-consonants and the *halant* sign (्) to denote absence of vowel, at the foot. The types required for hand-setting are cast on this basis. Four-line pica Devanagari type arranged in three steps is shown in *Fig.* 96-A and B. The *Akhand* setting method is shown in *Fig.* 96-C and D.

AKHAND AND DEGREE SYSTEM OF DEVANAGARI SETTING

257. A complete list of the Devanagari type sorts available from the Jaoji Dadaji Type foundry is given in Table 57 on pages 334-5. It covers both the *Akhand* as well as the *Degree* systems. The new degree founts issued recently by the type-founders like the Government Central Press, Bombay ; Mauj Type foundry, Bombay ; Gujarati Type foundry, Bombay and Prakash Type Foundry, Poona, are composed of about 155 sorts only, as shown in table 58 on page 336.

258. Several bookfaces in various sizes have been issued by the Jaoji Dadaji Type Foundry, which are still unsurpassed in beauty and legibility. Some of them are reproduced in Annexure H on pages 320-1. There is no type similar to *italic* in Devanagari, although slanting types are cut and are known as Devanagari italics . In the absence of Devanagari faces to resemble italics it is customary to use bold type for emphasis. During recent years several display faces are cut by the type founders referred to above. A representative selection of the display faces available in Devanagari from the type foundries in Bombay and Poona will be found in Annexure H. (Pages 322-323)

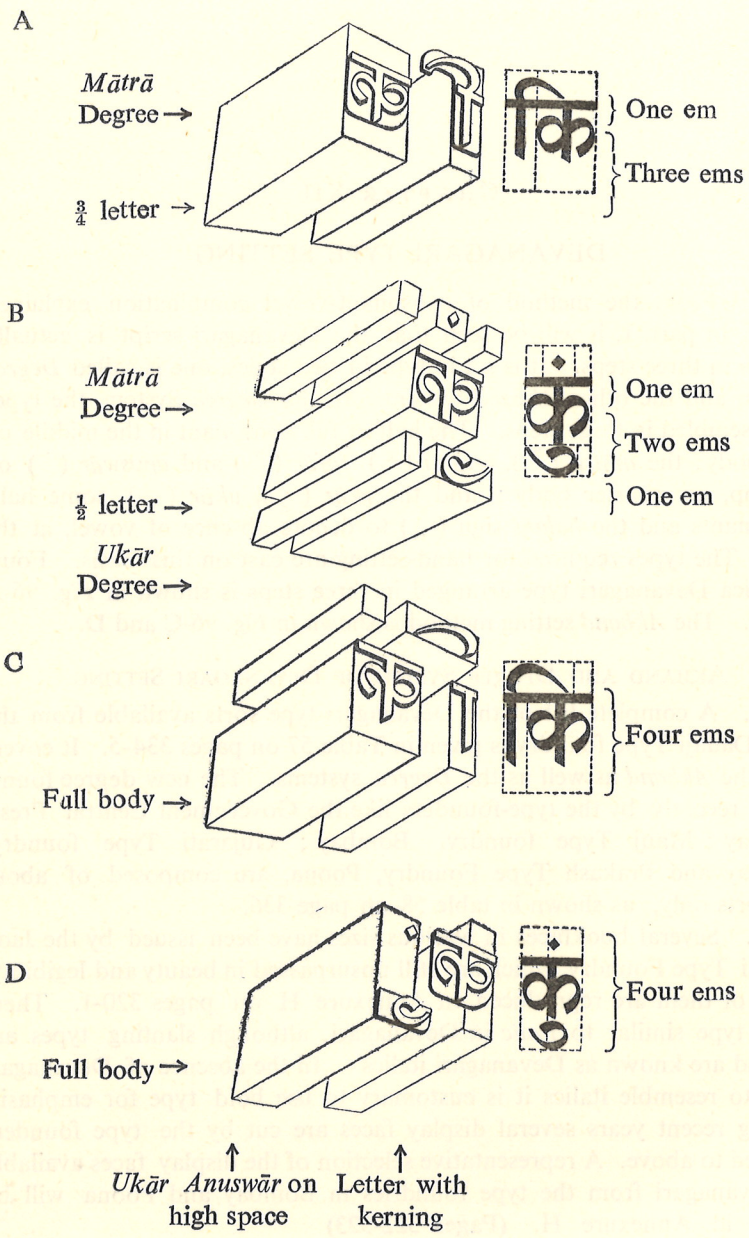

Fig. 96. **Degree and Akhand Type**

A New Conception in Devanagiri Type-setting

259. Ganesh Pandurang Vijapure, manager of the Kirloskar Press patented the Improved Vijapure Type in 1929. The object of his invention was stated as 'to add and to modify certain details in the existing printing types which will facilitate the work of composing by obviating the use of *degrees* as well as bring about an economy to the printer by reducing the number of types required to make up a complete fount.' Complete fount of the Vijapure type as patented is given on succeeding pages. The type sorts are classified and listed hereunder in three groups : (*a*) letters with verti-bar, (*b*) letters without verti-bar and (*c*) letters with central-bar :—

Table 55. **Fount of Vijapure Type**

	A	B	C	Nos.
Vowels	.. ऊ			1
Consonants	ख ग ङ च ज झ ञ ण त थ द न ध न प म य ल ह ळ क्ष ज्ञ	ड छ ट ठ ड ढ द र ऱ ह ळ ऴ	फ ॻ	37
Half Conjuncts	च्च ट्ट ड्ड ह्म श्र	ल ह्ह द	ॻ ह्ह ह्म ज्ञ	16
Full Conjuncts		ट्ट ठ्ठ ड्ड ढ्ढ द्द ह्म ह्न ह्मी ह्र छ्य ट्र ड्र छ्र		13
Vowel signs	ा ि ी ु ू े ै ॅ ॆ ं ँ ः ् ़ ॉ ॊ ो ौ	ॅ ॆ ॉ ॊ ॅ ः ँ ् ़ ॅ ॆ ॉ ॊ ॅ		31
Vowel signs with *Rafar*	र्ा र्ि र्ी र्ु र्ू र्े र्ै र्ॅ र्ं र्ँ र्ः र्् ऱ् र्ॉ र्ॊ र्ो र्ौ	र्ॅ र्ॆ र्ॉ र्ॊ र्ॅ र्ॆ र्ॉ र्ॊ		25
Double *Kana*, with *Matra* and *Velanti* do- with *Rafar*	ग ि ने ी ग ं ि ने ी र्ग र्ि र्ने र्ी र्ग र्ं र्ि र्ने र्ी			16
Figures, signs, punctuation marks	१ २ ३ ४ ५ ६ ७ ८ ९ ० (। : ! ? . , ; ' ' s – ×			10 13
			Total	162

260. The minimum number of type sorts in the Vijapure fount for hand-composition, as given on next page, is 123. In addition sixteen types are provided with double *kānā*, *velānti* and *mātrās* in order to save the setting time. Ten figures and thirteen punctuation marks, signs, etc., are required to complete the fount raising the total number to 162.

Table 56 **A Complete Font of improved Vijapure Type (162 Matrices)**

1. Half letters verti--bar removed (27)

2. Consonants without verti--bar (11).

3. Conjuncts of consonants without verti-bar (13).

4. Half conjuncts, verti-bar removed (15).

5. Vowels signs for letters with verti--bar (35).

6. Vowels signs for letters without verti-bar (22).

7. Figures, signs and punctuation marks (23).

8. Vovel signs with double Kana (16).

VIJAPURE SYSTEM : SOLID OVERHANG, AND THICKER SUPPORT

261. The main difficulty in linear composition is the placement of the vowel-signs at the top and the bottom. If the present design of Devanagari letters is not to be mutilated, the only remedy is to accept overhanging characters. However, Vijapure realised that the normal overhanging method used in Roman, *i.e.* the overhang supported by the shoulder height of the adjacent types, will not suit Devanagari. Firstly, Devanagari vowel-signs are small and projecting rather too far. Secondly, it is necessary to use many overhanging types owing to the peculiar design of the characters. Vijapure, therefore, proposed that the shoulder height of the supporting character may be reduced where the overhang is to be supported and the actual overhang may be cast with a deeper support.

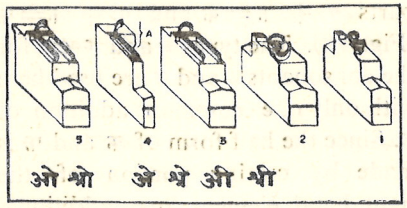

Fig. 97 : **Vijapure type : Construction of *Aksharas* from अ and ऋ**

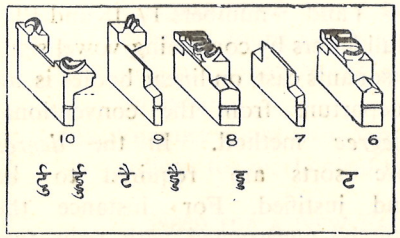

Fig. 98 : **Vijapure type : Construction of *Aksharas* from ट and ड**

262. In the accompanying drawing (*Fig. 97*) it would be seen that the letter श्री can be constructed by types 1 and 3 in which case no overhang is necessary. But the letter ऐ constructed with 2 and 4 is provided with the overhang with a deeper support shown at 'A' in the drawing. Similarly, in case of the second drawing (*Fig. 98*) the letter "ट" is made of two types, 6 and 7, where 7 is a filler type on which rests the overhang of ट which is cast on the thicker support. When the vowel sign, say, (ै) is to be attached to make टै, it is constructed with types 6 and 9, where the double mātrās (9) are cast on a thicker support. Similar is the case with letter टू where the types 6 and 10 would be used in combination.

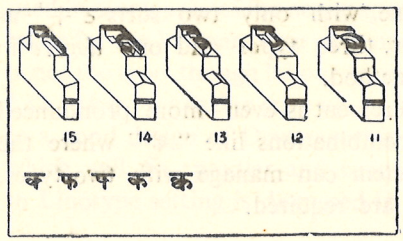

Fig. 99 : **Vijapure type : Construction of क and फ**

263. Construction of the letters क and फ in Devanagari is difficult. Vijapure solved this problem by splitting the letter vertically in two parts ठ + ह = क and ट + ह = फ (Fig. *99*). The types ठ and ट cut for the consonants व and प are used here with only one common addition of ह. Since the half form of क and फ is made by cutting portion of the right hand element one additional type ह (15) is cut. One more type (13) is cut to construct the conjunct क्ह. Vijapure suggested the novel method of constructing the conjuncts in their conventional design. For instance conjunct क्वे in क्वेटा is constructed with three types व े and ह shown at numbers 17, 18 and 20 (*Fig. 100*) क्वे in घ्वे is constructed by व े and ह numbers 17, 18 and 19.

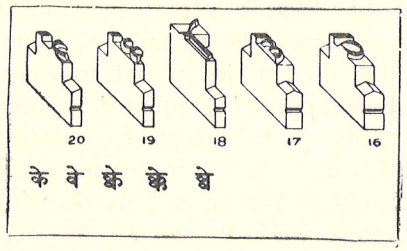

Fig. 100 : **Vijapure type : Construction of Conjuncts of क and व**

264. This method of constructing full letters by combining vowel signs with the consonants cast on linear bodies is an important departure from the conventional three-step *degree* method. In the *degree* method more sorts are required to be set up and justified. For instance the letter ओ can be constructed with only two types in the linear system of Vijapure while in the conventional three-step *degree* system four types are required, three types and one *degree* as graphically shown here (*Fig. 101*).

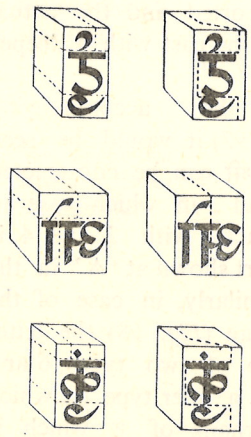

Fig. 101. **Setting of the Degree and Vijapure types**

The setting of letter ट्ठ in Vijapure system can be done with only two sorts ट + ठ as against four, three types and one *degree* in the *degree* method.

This requirement is even more pronounced in certain combinations like "कुं" where the Vijapure system can manage with two types, while in the degree system five sorts are required.

Vijapure's Typographic Experiments

265. Vijapure has contributed materially to the evolution of the Devanagari type founding, particularly in its linear setting. The Vijapure system of providing a deeper support to the over-hangs is beneficial for

hand-setting as it could be conveniently cast on the hand-casting machine. It is however unsuitable to the Monotype Composing system since the Composition casters use only one mould and the adjustment possible is, in set-size of the body, effected by the mould opening. S. R. Date who adapted Devanagari to the Monotype setting, had therefore, to satisfy himself with the normal method of casting the over-hangs.

266. Date has now introduced the system of casting the over-hangs, with deeper support, in casting sorts of for hand-setting. Simultaneously, Vijapure was working on a new system whereby the Devanagari could be set up without any over-hangs, so that the system could be adapted to the Slug casting machines. As a result of continuous work for many years, he brought out his famous Vijapure Type which was introduced first in the Marathi monthly magazine '*Kirloskar*' and later made available to the progressive printers. He introduced different founts for different purposes :

(1) Vijapure fount No. 5 of 255 type sorts for periodicals.
(2) Vijapure fount No. 6 of 324 type sorts for book work.
(3) Vijapure fount No. 8 of 209 type sorts for mechanical composing.
(4) Vijapure fount No. 9 of 194 type sorts without *Rafār* combinations for mechanical composing.

Need for a New Face in the Vijapure System

267. A complete list of type sorts in Vijapure type fount No. 6, is given on page 339. I have classified the sorts under three main groups—(*a*) Full verti-bar letters, (*b*) Short-bar Letters, and (*c*) letters with the bar centrally positioned. The sorts are further classified as vowels, full letters, half letters, conjuncts, vowel-signs, etc. The Vijapure type was being used in many presses for newspaper setting and magazine work. Punches made for the Vijapure type were not, however, based on good design and hence the type, though labour saving, did not become popular. Even the '*Kirloskar*' magazine gave up its use. If Vijapure system is employed to a good design of Devanagari it will be suitable for hand composing which will be speedier and economical. The Vijapure system adapted to Linotype setting is discussed in a subsquent Chapter.

Annexure I

DEVANAGARI TYPE FOUNTS

Table 57 : **A Fount of Nirnaya-Sagar Devanagari Types.**

1	Vowels on full body.	अ इ उ ऊ ऋ ॠ ऌ ॡ ए ॐ ॐ	11
2	Consonants on full body.	क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ	36
3	Short *i* Combinations.	कि गि चि जि टि डि णि ति थि दि धि नि पि बि भि मि यि रि लि वि शि षि सि हि क्षि	25
4	Long *i* (ī) Combinations.	की खी गी ची जी झी टी ठी डी णी ती थी दी धी नी पी फी बी भी मी यी री ली वी शी सी ही श्री	28
5	Long & short *i* Combinations with anuswar.	किं हिं कीं णीं तीं नीं यीं लीं हीं	9
6	Short *u* Combinations.	कु खु गु घु ङु चु छु जु झु ञु टु ठु डु ढु णु तु थु दु धु नु पु फु बु भु मु यु रु लु वु शु षु सु हु ळु क्षु ज्ञु	36
7	Long *u* (ū) Combinations.	कू खू गू घू ङू चू छू जू झू ञू टू ठू डू ढू णू तू थू दू धू नू पू फू बू भू मू यू रू लू वू शू षू सू हू ळू क्षू ज्ञू	36
8	Mātrā Combinations.	के खे गे घे चे छे जे झे टे ठे डे ढे णे ते थे दे धे ने पे फे बे भे मे ये रे ले वे शे षे से हे ळे क्षे ज्ञे है औ और	37
9	Mātrā-anuswār & double-Matras.	कें चें जें टें ठें डें ढें णें तें थें दें नें में यें रें लें वें शें सें हें ळें हैं	22
10	Spl. letters with anuswār & Rafār.	अं रं सं ई णी ती थी मी वी षी िं ीं	12
11	*Nuktā* letters.	क़ ख़ ग़ ज़ ड़ ढ़ फ़	8
12	Characters for Mātrā and Ukār Combinations (1/2 body).	अ क ख ग घ च छ ज झ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ	35

13	Characters for *Mātrā* Combinations (3/4 body).	क ख ग घ च छ ज झ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ	34
14	Half letters (*a*) Consonants.	क़ ख़ ग़ घ़ च़ छ़ ज़ झ़ ञ़ ण़ त़ थ़ द़ ध़ ऩ ट़ फ़ ब़ भ़ म़ य़ ऱ ल़ व़ श़ ष़ स़ ऴ क्ष़ ज्ञ़ क़ ख़ ग़ ज़ फ़ त्त श्र ब्र भ्र म्र क्त ह्न ह्र ह्म ब्र व्र ह्र रु य र्	49
15	Vowel Symbols full body.	ा ि ी ु ू ृ े ै ॅ ॉ ो ौ	11
16	Vowel Symbols (*a*) Mātrā Degree.	ा ि ी ु ू ृ े ै ॅ ॉ ो ौ ा ि ी ु ू ृ े ै ॅ ॉ ो ौ	22
17	Vowel Symbols (*b*) *Ukār Degree.*	ु ू ृ े ो ौ	6
18	Letters *for conjuncts on *Ukār degree.*	उ क ल्ल ल्ल क ख ग ज ढ त न म र ल ल व	16
19	Conjunct letters Full body.	क्ु क्क क्त क्र क्र क्र क्ल क्क ख्र ग्र ग्म ग्र घ्र घ्न घ्र ङ्क ङ्ख ङ्ग ङ्घ ङ्म ङ्ल च्च च्न च्र ज्ज ज्ञ ज्र झ्र ञ्च ञ्ज ट्ट ट्य ट्र ठ्य ड्ड ड्य ढ्ढ ढ्य त्र त् त्त त्र त्य त्र त्त भ्न श्र द्द द्ध द्द द्र द्ध द्म द्र द्ध द्र द्ध ध्म ध्य ध्य ध्र ध्र ध्र न्न न्न न्र प्त प्त प्म प्र प्र फ्र फ्र फ्र ब्र ब्न ब्र भ्र भ्न भ्र म्र म्र म्न म्र ल्ल व्र व्न व्र श्र श्च श्न श्र श्ल श्व ष्ट ष्ठ स्र स्त्र स्त स्थ स्न स्म स्य स्र स्व ह्र ह्न ह्न ह्य ह्म ह्र ह्र ह्म	115
20	Figures.	१ २ ३ ४ ५ ६ ७ ८ ९ ०	10
21	Punctuation marks & signs.	. , - ’ : ; ? ! ([/ … ॐ ⁄ ⁄⁄ ⁄⁄⁄ + × = ÷ । ॥ ।।। s * † ‡ § ¶ ‖ √ – —	33
22	Spaces.	3 to Pica, 4 to Pica, 6 to Pica, Quad ems 2, 3, 4, 1 ½.	8
23	*Degrees.*	6, 5, 4, 3, 2½, 2, 1½, 1¼, 1, ¾	10
		Total …	609

* Inferior letters for use as *ukār degrees* for conjuncts.

Table 58. **The Fount scheme of Degree system recently introduced.**

Vowels (½ letters)	अ इ उ ऊ ए ऋ	6
Consonants (½ letters)	क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ	36
Full letters	ॐ रु रू	3
Half Consonants	क् ख् ग् घ् च् छ् ज् झ् ञ् ण् ट् ठ् ड् ढ् ण् त् थ् द् ध् न् प् फ् ब् भ् म् य् ह्य् ल् व् श् ष् स् ह् ळ् क्ष् ज्ञ्	30
Conjuncts	क्र ख्र ग्र ज्र ट्र ठ् ड् त्त त्त्र त्र न् द्द द्ध द्ब द्म द्र द्य द्र द्व प्र फ्र ब्र भ्र म्र व्र स्र स्त्र ह्र ह्य ह्म श्र श्रे	34
Kānā	ा ि	2
Mātrās	ु ू ृ ॅ े ै ॉ ो ौ ं ः ँ ु ू ृ ॅ े ै ॉ ो ौ ् ॅ ं ः ँ	20 4
Figures	१ २ ३ ४ ५ ६ ७ ८ ९ ०	10
Signs and Matras	, ; . : -) [? ! ।	10
		155

Table 59 : **Vijapure type Fount No. 6**

	Letters with verti-bar	*Letters with short-bar*	*Letters with central-bar*	
Vowels	ॐ अ आ इ ई उ ऊ ए ऐ		ऋ	5
Full Consonants	ख ग घ च ज झ ण त थ ध न प ब भ म य व श ष स क्ष ज्ञ	ङ छ ट ठ ड ढ द र ल ह ळ	क	34
Letters with extended head-line	अ च ज ण त न प म य व स	द र ल ह		15
Half consonants	ख् ग् घ् च् ज् झ् ण् त् थ् ध् न् प् ब् भ् म् य् व् श् ष् स् क्ष्	ङ् छ् ट् ठ् ड् ढ् द् र् ल् ह् ळ्	क् ञ् ः फ् रु्	28
Full conjuncts	ग्र त्त ब्ध द्य त्र प्र ब्र च्र श्र	छ्र ट्र ड्र ढ्र द्र ह्र द्व ह्म	व्र	23
Half conjuncts	त्त त्र			2
Short *Ukār*	ख़ु ग़ु घ़ु च़ु ज़ु झ़ु ण़ु त़ु थ़ु ध़ु ऩु प़ु ब़ु भ़ु म़ु य़ु व़ु श़ु ष़ु स़ु क्ष़ु	ङ़ु छ़ु ट़ु ठ़ु ड़ु ढ़ु द़ु ऱु ल़ु ह़ु ऴु	ञ़ु ः़ु फ़ु रु़ु व्ऱु प्ऱु	35
Long *Ukār*		छ्रू ट्रू ड्रू ढ्रू द्रू ह्रू द्वू ह्मू		11
				153

	Letters with verti-bar	*Letters with short-bar*	*Letters with central-bar*	
Mātrās letters	खे गे घे चे जे झे णे ते थे धे ने पे बे मे मे ये वे शे षे से क्षे ज्ञे त्रे	छे टे ठे ढे ढे दे दै रे ले हे ळे ह्र	जे वै पै	38
Vowel-Signs	ा ि ी ु ू े ै ॅ ॉ ो ौ ं ँ ः ़ ् ॆ ॊ ॅ ॅ ॄ ॢ		ॉ ॉ	25
Rafāri Vowel-Signs	ि ी ी ी ॅ ॅ ि ी ी ी ॅ ॅ ि ी ी		ी ी	17
Figures and Signs	१ २ ३ ४ ५ ६ ७ ८ ९ ० (। : ! ? . , ; ' ऽ — ...			22
				255

Additional Types : *Akhand*

				20
Extras with extended head-line.	अु गु चु जु णु तु नु पु बु मु यु वु शु सु	दु डु ढु हु ळु	कु	
				20
	अू गू चू जू णृ तू नू पू बू मू यू शू सू	दू हू ह्रू वृ ल्रृ ह्रृ	कू	
				21
	अे गे चे जे णे ते ने पे बे मे ये वे शे से	दे ढे टे रे ले हे ट ड	के	
	ग ब श		फ	6
	ि ी			2
				69

CHAPTER XIII

DEVANAGARI SCRIPT REFORMS

268. The Devanagari script composed in the three tier or the *degree* system* contains comparatively very few typographical deficiencies. The problem presented to the script reformers was, therefore, that of simplification and rationalisation of the conjunct letter. With the advent of the composing machines developed in America and England, the speed of composing was increased. The Missionaries in the West investigated the possibility as to whether scripts, other than Roman, could be adapted on the machines built for setting the Roman script. However, due to large number of Devanagari signs and owing to the difficulty of adjusting the over-hangs of *mātrās* and *ukārs*, Devanagari could not be adapted to the Roman machines. Consequently Rev. J. Noels suggested[1] that for writing the diverse Indian languages, adaptation of Roman would be a beneficial idea. By itself, the Roman alphabet of twenty-six letters was imperfect and therefore not suitable to the Indian languages which are efficiently represented by the phonetic scripts in which they are written. The use of diacritics increases the number of signs in the script. But their use economises space. The diagraphs are composed from less number of signs, but need more linear composing space.

ONE SCRIPT MOVEMENT

269. The progressive Marathi pundits, foreseeing the need of a rational script for Marathi, adopted Devanagari at the beginning of the nineteenth century, in preference to their traditional Modi script. Bengal did not lag behind in progressive vision and in 1908 Justice Sharadacharan Mitra founded an institution for the spread of One Script (*Eka Lipi Vistār Parişad*) and started a magazine '*Deva Nāgar*'.

LARGE NUMBER OF TYPES IN DEVANAGARI : A HANDICAP

270. It is admitted fact that the three-step setting of the Devanagari script is a laborious task and a difficult job from the point of view of justification. The fillings on the top and at the foot called *Degrees* drop

*Degree and *Akhanda* systems, *see* Fig 96, p. 328,

out, creating cavities in which the nearby types slip, disturbing the alignment. The normal fount for hand composing in Devanagari, in this style, consists of about 400 type sorts. Attempts have been made by the Devanagari punch-cutters to do away with the three-step setting by casting the *velānti*, *mātrā* and *ukār* signs on their body with overhangings. This system is known as *Akhand* in which the fount is made of over 600 types.* The Akhand System has also been adapted to the Gujarati script except for a very few characters. Gujarati normally requires about 475 or more types.

271. In the pamphlet *Reform of the Nagari Script* [2] published by the Language Department of the Government of Madhya Pradesh, it is stated that ' it was the Nagari Pracharini Sabha which for the first time made some suggestions for the reform of Nagari '. This statement is not based on facts as the history of script reforms can be traced back to some sixty years. Ramchandra Bhikaji Gunjikar was probably the first scholar to advocate the necessity of reforms in the Devanagari Script.†

Lokamanya Tilak : Pioneer Advocate in Devanagari Linear Setting

272. The necessity of introducing linear type setting was felt as far back as 1904, when the late Lokamanya Tilak took up the improvement in type casting, so as to facilitate the adaptation of the Devanagari script to the composing machines. The efforts of Lokamanya Tilak are explained in detail in Appendix 'A' . The famous Nirnaya Sagar Type-foundry accepted his suggestions and issued a new fount in linear design as shown below :

हल्लींच्या अबकारी कमिट्यांपुढें विचारार्थ आलेल्या सूचनांचीं वासलत
कशी लागते याचा मासला म्हणून आम्हीं पुणें शहरच्या कमिटीच्या कामाची
त्रोटक हकीकत ता० ३० जानेवारीच्या अंकांत दिली होती त्या हकीकती-
वरून कमिटीपुढें आलेल्या सूचना सरकारी अधिकाऱ्यांकडून कशा फेटाळून
दिल्या जातात हें उघड होतें अर्थात् वस्तुस्थिति अशीच आहे.

Fig. 102. **Nirnaya Sagar version of the Tilak types** [3]

This subject again attracted attention of those interested, when the *Masik Manoranjan*, a Marathi magazine issued from Bombay (edited by Kashinath Raghunath Mitra), published two articles on the Devanagari script[4]. Immediate occasion for the discussion was the suggestion of Rev. Noels regarding acceptance of the Roman script for Indian languages.

273. Since then several scholars have contributed to this subject. The late K. K. Gokhale, a judge from Jat, suggested a reformed version of the

* Fount of Devanagari Type, *Table* 57, pp 336-7. † *See* Appendix A.

Devanagari script. Some matter, set up in his style, used to be published in the *Dainik Dnyānprakash* of Poona. Bhau-Shastri Lele advocated[5] his new one-step setting of Devanagari without the ascenders and descenders of *mātrās* and *ukārs*. The Nirnaya-sagar Type-foundry came out with a reformed system of Devanagari setting as shown hereunder :

प्उरत्झ च्णाकश्झ क्ण्ल्याश्इवाय. एखाद्यास अपराध्झ मान्ऊन
श्इक्षा करण्एञ फार वाइट आह्ए. या प्रकारच्या न्याय कर-
णाराञ्च्या उताञ्झळपणाम्उळ्एञ खरए ग्उन्ह्एगार अज्झबात स्उ-
ट्ऊन क्इत्य्एक व्एळाञ न्इरपराध्याञ्स व प्उष्कळ व्एळ ह्इतक-
स्त्याञ्स द्ण्एख्झल व्इनाकारण म्ण्ठाल्या श्इक्षा झाल्या आह्एत.

Fig. 103. **Nirnaya-sagar Type for linear composing** [6]

Vaidya brothers of the Hindu Missionary Society contributed their suggestions in this regard. Br. Savarkar started a campaign through the weekly paper *Shradhānand.* Y. M. Nanal, S. D. Nadkarni, N. B. Huparikar, S. S. Pandit, Benare, G. S. Bhagawat, V. D. Gurjar and others put up their own solutions to the problem. They are all summarised in Appendix ' A '.

The Work of Literary Conferences

274. In the Annual Marathi Sahitya Sammelan held in 1927 at Poona, a committee was appointed to make recommendations on the changes in the script to facilitate printing. The committee reported to the Hyderabad Session in 1931. The difficulties presented by the Devanagari script in its composing were thus also engaging the attention of the literary and learned conferences. A. Latif of the Indian Civil Service advocated the use of Roman script for Indian languages. He was supported by the Late Sayajirao Gaikwad in the Baroda session of the Oriental Conference. Sayajirao Gaikwad later discussed the script reforms in his address to the Marathi Sahitya Sammelan held at Kolhapur in 1932. He again touched this subject in the Hindi Sahitya Sammelan held at Delhi in 1934, when a committee was constituted to investigate into this subject and Kakasaheb Kalelkar was appointed the chairman to this committee. The Maharashtra Printers' Conference discussed the script reforms in its session, held at Sholapur in 1941, under the presidentship of Y. R. Date.

Script Reforms at the Governmental Level

275. The U.P. Government appointed a committee under the chairmanship of Acharya Narendra Deo, by a resolution dated 31st July 1947. The committee reported to the Government in May 1949.[7] The

Bombay Government appointed a committee under the chairmanship of Kakasaheb Kalelkar to go into the question of script reforms which reported in 1949.[8]

276. Later, the Constituent Assembly of India and the Government of Uttar Pradesh appointed committees to consider this question. The Standardisation of National Language Conference was convened by the Government of Madhya Pradesh in 1950 under the presidentship of Dr. Rajendra Prasad. The recommendations of this Conference were not, however, considered, as the report of the Narendra Deo Committee appointed by the Uttar Pradesh Government was then awaited. The Uttar Pradesh Government convened a conference in 1953 to examine the decisions of the Narendra Deo committee, in which the Chief Ministers of many States participated. The minutes of discussions at this conference were circulated by the Uttar Pradesh Government to the Union Government and to all the State Governments. The Government of Bombay accepted[9] the above reforms for only Hindi. The Government of Madhya Pradesh, however, did not agree in certain respects, particularly in the matter of *rafāri* (◌ॅ) letters, *i.e.* 'R' combinations, and the short i (इ) vowel-sign. They resolved in favour of the conventional style of combining र with other consonants, *i.e.* = ◌ॅ and ◌ॅ in preference to the use of *halant* as in सर्व for सर्व. The arguments in justification of their decisions have been fully set out in the pamphlet '*Reform of the Nagari Script*'.[10]

Three Different Aspects of the Reforms

277. The problem of setting the large number of the Devanagari types has thus been engaging the attention of the type-founders and scholars alike, since the beginning of the present century. The examination of the work of the script reformers shows that it relates to three distinct aspects :

(*a*) Improvement in the script with a view to facilitate faithful graphic representation of all the phonemes, including those in the foreign words in order to maintain the precision of the language.

(*b*) Change in the present method of joining the vowels with the consonants, for elimination of the three-step method of setting and changes in the method of the conjunct formation which are aimed at the reduction in the number of types.

(*c*) Change in the present method of casting type sorts so as to facilitate linear setting either with or without over-hangs and thus provide the desired facility for mechanical composition.

Standardization of the Graphemes

278. The work on (a) is in the sphere of grammar and it relates to evolution of the script to meet the needs of the language. 'Madhup'[11] (Krishnaji Keshav Gokhale) and Vinoba Bhave[12] are more concerned with this aspect of the script reforms. Since the purpose of printing is to graphically represent the phonemes in the language as they are spoken, with due regard to grammar, standardisation of the script is a pre-requisite to any attempt towards type-casting and mechanical composition. But unfortunately, this problem, which is essentially that of grammar and orthography, got mixed up with improvement in type-founding methods, for easy composition. The problem of standardising the script on the basis of requirements of the language was discussed in the Hindi Sahitya Sammelan, Maharashtra Sahitya Sammelan, and the Lucknow Conference. These conferences also considered many other problems such as the technical requirements of mechanical composing machines.

279. Obviously no typographer can work on type designing and type-founding with any success, unless the script is standardised. But it was not till 1961 that the Government of India came to a firm decision on the standardisation of the Devanagari script.[13] The Government of Maharashtra accepted this decision with some modification in 1962.[14] There is still scope for improvement and thus the finality is only temporary. Nevertheless, the work of typographers and those working for adaptation of the Devanagari script to mechanical composing is facilitated to a great extent. The design of the graphemes and the method of placement of vowel-signs have not been altered in the standardised script. A comparative statement of the standardised script is given in *Table* 60, pages 354-361. My comments on the standard script are given in paragraphs 292-5, pages 352-3.

Linear Setting of Devanagari

280. Inevitably the original Linotype design of Devanagari letters introduced by Hari G. Govil was based on linear setting of the vowel-signs. The Nirnaya Sagar Type Foundry again came out with a new version of Devanagari for hand-setting based on Hari G. Govil's design as shown below :

तीन रुपये दरमहा घेऊन दगडावर टाईप घांशीत बसणारे त्या वेळचे ते पोर पुढे अशा योग्यतेस येईपर्यंत असे कोणाच्या स्वप्नातही नव्हते आणि त्या वेळच्या त्यांच्या बरोबरच्या पोरांत दुसरे कोणी असे पुढे आलेही नाही.

Fig. 104. **Nirnaya Sagar fount based on Govil's design**[15]

Attempts to reduce the Number of Type Sorts

281. The work of Bhau Shastri Lele, P. B. Kale, V. S. Gharpure, Vaidya, Bhagwat, Gurjar, Benare, S. S. Velingkar, Kakasahib Kalelkar and others relates mainly to the second aspect of script reforms, *i.e.* change in the method of consonant vowel-sign combination and the ways of reducing the number of types. Some of them have advocated the placement of vowel-signs after the consonants in the same line thus eliminating the three-step arrangement. Some recommended placing the vowels in original form after the consonants. In this context it must be remembered that there is distinction between a vowel proper and a vowel-sign. In the Roman script the vowel in original form is placed after the consonant, resulting in introduction of the spelling system. In Devanagari the vowels इ, ई, उ, ए etc. when combined with consonants to construct letters, take the form of vowel-signs (ि ी ु े) and wrap the consonant, from the left, right, bottom and top as the case may be (कि, की, कु, के). This is the peculiarity of the Devanagari script. If this is given up in favour of placing the vowels in the original form, after the consonants, then what we may produce is a new script based on a foreign convention, but using the Devanagari graphemes.

Kale's Bharati Script

282. P. B. Kale entered the discussion on script reforms in 1914 when he wrote an article criticising Rev. Noels and made his own suggestions.* Kale revived his proposals after the publication of the Report of the Maharashtra State Committee on Standard Keyboard for Devanagari. He had been most active in this field during the last few years. Kale presented his scheme to the late Pandit Jawaharlal Nehru in the form of an engraved copper-plate. His main proposal is that the vowel-marks in improved design may be placed after the consonants. The Kalelkar Committee had recommended such a proposal but it was limited to the placement of the vowel-signs only. The design of the vowel-signs was not then proposed to be altered much. Kale has realised the effect of placing of the vowel-signs after the consonants, which results in disturbing white space. He therefore advocates redesigning of the *mātrā* signs. His other suggestion was to use the *halant* in forming conjuncts. He suggested that the method of joining 'य' in conjuncts may be adopted even for conjuncts of 'र' which are frequent. Kale also designed a linear *halant* sign. He afterwards modified his proposals particularly the graphemic

* *See* Appendix A.

representation of vowel-designs. A print from the last version of his linear Devanagari or Bharati Lipi, is reproduced in *Fig.* 105 below :

12 Point Bharati

चर्चेचा कपोलकल्पित अर्थ (अनर्थ) लाऊन कार्पोरेशन अॅम्प्लॉइज अॅसोसिअेशनला असें सूचवित आहे कीं, कार्प्यूटर्सवर काम सुरू करेल्यामुळें जया समस्या निर्माण होतील त्यावर विचार करण्याकरितां अॅसोसिअेशनच्या प्रतिनिधींनीं कार्पोरेशनबरोबर संयुक्त वाटाघाटी करण्यास तयारी दाखवावी. कार्पोरेशननें शिस्त संहिता मान्य करेली असून मॉडेल अॅग्रिमेंटमधील अटींचें पालन करण्यास स्वतःची तयारी व्यक्त करेली आहे असेंहि ठोकून दिलें आहे.

12 Point Mono

चर्चेचा कपोलकल्पित अर्थ (अनर्थ) लाऊन कॉर्पोरेशन एम्प्लॉइज अॅ सो सि ए श न ला असे सु च वि त आहे की, कॉम्प्यूटर्सवर काम सुरू केल्यामुळे ज्या समस्या निर्माण होतील त्यावर विचार करण्याकरिता अ सो सि ए श न च्या प्र ति नि धी नी कॉर्पोरेशनबरोबर संयुक्त वाटाघाटी करण्यास तयारी दाखवावी. कॉर्पोरेशनने शिस्त संहिता मान्य केली असून मॉडेल अॅग्रिमेन्टमधील अटीचे पालन करण्यास स्वतःची तयारी व्यक्त केलेली आहे असेही ठोकून दिले आहे.

हमारी परमपरीय पश्धानमन्तरी शश्री लालबहादुर शास्तश्री जी की लीयी ईश्वर करी यह शुभ दीन बार बार आयी.

नागपुर, ता. 2-10-64. पुरुशोत्तम बाळकृश्ण काळी.

टाटा मर्सीडीझ-बी॰झ गाडीया॰, अ॰ब॰सडर कार, आईर जीप की बीपारी आईर दीवनागरी टाईप की क॰पा॰झीटर, अीलीक्टशीकल अी॰जीनीयर तथा ट॰कलीअक, अधीकतर 'भारती लीपी' की स॰शोधक (जीससी चालू दीवनागरी लीपी की छपाअी, ट॰कलीअन आईर टीलीपशी॰टी॰ग सुलभतासी तथा कारअक्षमतापूरवक होता हे हे, लीकीन रोमन लीपी सीभी 12 पशतीशत जयादा कारअक्षमता बदती हे).

Fig. 105. **Kale's Linear Devanagari or ' Bharati Lipi'** (Earlier Version)

Shirwadkar's Linear Devanagari

283. Shirwadkar has recently taken up the advocacy of linear setting of Devanagari script. He first raised the question in his presidential speech at the Margao Session of the Marathi Sahitya Sammelan (1964).

Later, Potnis, editor of *Daily Gaokari*, supported Shirwadkar in his presidential address to the Maharashtra Mudran Parishad, held at Sholapur in 1966. Main feature of Shirwadkar's proposal is discarding of the head-line, modification of the design of the vowel-sign and introduction of a conjunct sign (ʌ). (*See* appendix A for details).

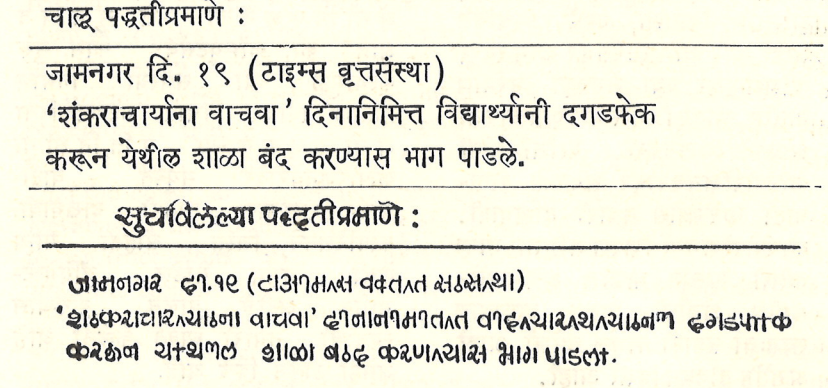

Fig. 106 **Shirwadkar's hinear Devanagari.**

284. The argument of the inevitability of drastic changes for mechanical composition put forth by many of the advocates of the above suggestions, is in itself doubtful and is based, to some extent, on lack of appreciation of what can be achieved on the composing machine. Secondly, the result of the acceptance of these suggestions would be that the printed script would be changed to such an extent that it would look like a new script. Those who would be taught to read the mutilated script advocated by Bhagwat, Benare and others, will remain illiterate as far as the books so far printed in the current Devanagari are concerned. Some of these script reformers claim that the books can be reprinted in the new script, invented to suit the machines. Unfortunately, they do not realise the fantastic requirements of reprinting, the production facilities required to be provided and the time and expenditure involved. Such a drastic change in the script is nothing short of accepting a new script. Interestingly enough, the advocates of these suggestions press for the introduction of these so called reforms mainly to avoid acceptance of the Roman script.

Typographers at Work

285. The third aspect of the script reforms is the change in the present method of casting types. The pioneer thinker on this aspect of

the script reforms is the Late Lokamanya Tilak and the contemporary typographers working on this aspect are Hari G. Govil, S. R. Date, G. P. Vijapure and L. S. Wakankar. The work of these typographers is related mainly to the adaptation of the Devanagari script to the mechanical composing machines. The contribution made by S. R. Date is dealt with while commenting on Monotype Devanagari while that of Vijapure is dealt with in Chapter XII.

286. L. S. Wakankar is one of the script scholars who has studied the Devanagari script from both the calligraphic as well as the typographic points of view. The Government of India Committee on Standard Keyboard for Typewriter and Teleprinter recently invited suggestions for a modified Devanagari script for the teleprinter. The Committee has proposed the use of *halant* in conjuncts. In response to the invitation of the Committee for comments, Wakankar has put up a novel scheme of splitting the Devanagari letters obliquely which makes it possible to use the common vowel-marks for both the letters with verti-bar and letters without verti-bar or with small-bar. A patent was applied for this scheme by Ramu and Wakankar. The scheme is reproduced in *Fig.* 107.

Limitations of the Composing Machines

287. The demands of the stereotyping process also affect the design of the type and the method of setting. The early practice of a three-step degree method of setting had helped in retaining the aesthetic quality of the letter forms of the Devanagari script. It will, however, be conceded that some distortion is inevitable with the change in the design when the script is to be adapted to the mechanical composition. However, there has always been opposition to any drastic change in the *look* of the script as was fully realised by the pioneer script reformer, the Late Lokamanya Tilak.[16] Owing to the opposition to the change of the design of the letters S. R. Date who succeeded in adapting the Devanagari script to the Monotype machine had to rely on the *Akhand* system of composition, and had to stretch it rather too far. The letters which cannot be made available in full form are cut with over-hangs to be completed by inserting high space with vowel-signs at the top and bottom. The Date method of Monotype setting is explained earlier.

288. Owing to the fact that the Linotype matrices carrying the engraved impression are set in a line in the Linotype system, it is not possible to use the Linotype for setting the three-step Devanagari; neither is it possible to set Devanagari on the Linotypes in the *Akhand* system of Date, as over-hangs are equally impossible on the slug composing machines. It is for this reason that even the italics are required to be

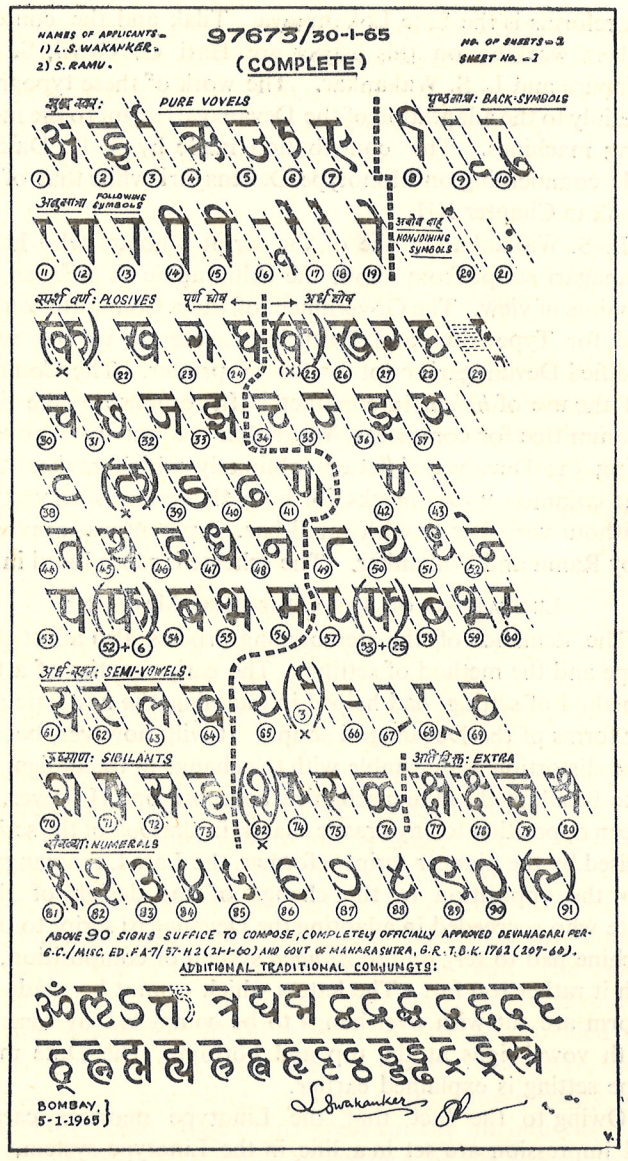

Fig. 107. **Linear oblique type of Wakankar.**

straightened up to some extent on the slug composing machine leaving white space between the letters. Besides the capacity of the main keyboard and the magazine is limited to ninety matrices. With a side-magazine thirty-four more matrices can be accommodated and by using the second positions on the double-letter matrices eighty-seven more characters can be set from the keyboard. The total number of characters which can be set on the plain Linotype with the Greek attachment is only 174 exclusive of three space-matrices.

The Basic Problem

289. The problem before the script reformers is essentially to produce all the graphemes and their combinations for constructing full letters and conjuncts with a minimum number of type-sorts or matrices without altering the *look* and sacrificing the beauty of the script. There are thus three difficulties in adapting Devanagari to the mechanical composing machines :

(1) The total number of characters is required to be reduced to the minimum of 255 for the Monotype.* For the Linotype, ninety characters of high frequency to be accommodated on the main keyboard, thirty-four on side keyboard and very few as hand-sorts.

(2) The method of setting the types of full letters by joining the vowel-signs on all the four sides of the consonants is required to be revised in favour of linear setting.

(3) The method of constructing the conjuncts by attaching consonants at the bottom (ट्ठ) ; inserting them on either of the two sides (द्व, ह्म) and producing altogether a new grapheme (त्र) representing two consonants त् + र should be changed in favour of linear setting, *i.e.*

ट्ठ *or* ट=ठ, द्व or द=व, ह्च, त्र

290. The choice left before the exponents of Devanagari script who are against the acceptance of Roman script was, therefore, either to invent a machine to suit the peculiar setting of Devanagari or to alter the setting methods including conjunct formation to suit the linear setting. The former was considered impracticable and hence all the script reformers have relied on the latter course as will be seen from the summary of the Script Reforms given in Appendix A.

Methods of Reduction in Type Sorts

291. Owing to the uncertainty of the final decision in this matter of standardisation of Devanagari script the type designers did not make much headway and its satisfactory adaptation to the mechanical composing

*The Monotype with a die-case of 270 matrices in now available.

machines was delayed. In almost all the attempts in reforming the Devanagari script emphasis was on reducing the number of characters in a fount. The step towards acceptance of the method of constructing conjuncts by placing the consonants one after the other, first consonant being either in half form or with *Halant*, was helpful and the number of types was considerably reduced. This step along with introduction of the *Swarākhadi* coupled with the possibilities of using over-hangs and *Halant*, resulted in considerable reduction in the number of types for both the hand-composing and the Monotype composition.

Comments on the Standard Devanagari

292. The Devanagari script as was standardised for Marathi by the Government of Maharashtra* differed from that accepted by the Government of India in few respects, as shown hereunder:

	Hindi	*Marathi*
(1) Vowels	ऋ , ऌ,	ऋ, ऌ
(2) Consonants	ख, छ, ल, श	ख, छ, ल, श
(3) Figures	५, ८	५, ८

(*a*) I see no reason why the Hindi forms of vowels ऋ and ऌ should not be accepted for Marathi. It is possible to construct the letters ऋ and ऌ, which do not occur very frequently, by combination of the available type sorts ऋ, ॅ , and ृ and ऌ and ॄ respectively. The Hindi forms of ख and श are now accepted by the Government of Maharashtra.†

(*b*) The letter ख accepted for Hindi can be accepted for Marathi. The change in the design of ख is long awaited. The acceptance of Gujarati form of ખ has been advocated since long, but calligraphically it is foreign to the present design of Devanagari letters.

(*c*) In case of ल its acceptance reduces two matrices for Linotype as ल and ले can be constructed by joining ल and ा and ले and ॅ respectively.

(*d*) The Marathi form of श is not according to the Devanagari convention where in the *A-kār* is present in the consonants either in the form of verti-bar (च) or short-bar (ट). In the Marathi form of श both are present. The Hindi form (श) is therefore preferable. An argument against the acceptance of श is that it possesses a loop which may fill in while printing. We have already introduced loops in case of भ and ध and one more may not make material difference.

(*e*) The Hindi form of छ is not acceptable as the short-bar is omitted, and it therefore suggests the absence of अ. In its place the Marathi form छ should be substituted.

* *See* Table 60, pp 354-361. † G.R. देनांक 1066 म dated 24th Sept. 1966

(*f*) Two numerals ५ and ८ have been accepted in the North Indian design for Hindi. They do not blend well with other figures of the Bombay style. The Bombay numeral forms should therefore be accepted even for use in Hindi.

Simplification of *R*–conjuncts

293. Linear design of the conjuncts has been accepted in the standard script in all cases except in case of conjuncts of र. Table 66 will show that the use of *rafār* in its present design increases the number of matrices required by 22. Use of *halant* (्) is not considered advisable as the frequency of conjuncts of र is high and will therefore require more linear space. The half ॅ used in ॅहास is not accepted for *rafār* as it is currently used in Marathi to represent unaccented ्र, while the *rafār* is accented. Some of the script reformers have advocated that the present form of ॅ may be continued but that it should be placed in the phonetic sequence, i.e. सॅ्व for सर्व and काॅष्ण्येय for काष्ण्यर्य. I feel that the accented ॅ may be replaced by ॅ with a *nukta*. The conjuncts of र as second member in the conjuncts, are at present written in two distinct forms प्र and ट्र. They can be written in linear design without any difficulty, i.e. प्र and ट्र. As a matter of fact in the absence of separate conjunct sorts in some founts it is being done and has not been objected to.

Problem of the Central-bar and Short-bar Letters

294. The letters with central bar क and फ present difficulty in their linear setting with vowel-signs. A remedy suggested in this respect is that they should be provided with a *kānā* (का and फा). An objection has been raised that the *kānā* in addition to the central bar is likely to be mistaken for *Ā-kār* (i.e. का = का). The Hindi ऋ also posseses two veri-bars. It may be worth considering whether the Gujarati forms ક and ફ, which are not foreign to Devanagari, may be substituted with the addition of head-line, modeling them on ड.

Introduction of the Swarakhadi

295. Savarkar advocated adaptation of *swarākhadi* in the construction of vowels इ, ई, उ, ऊ, ए, ऐ, by joining *Mātrās* of these vowels to अ, as is done in case of आ, ओ and औ. Gujarati uses this method for ॲ and ઍ and there should be no objection to its extension to the other vowels. Objection to this reform on the plea that these vowels are separate entities and not modifications of the vowel अ, is not tenable as there is no reason why the modifications thus achieved should not be considered as distinct new forms.

Table 60. **Standard Devanagari Alphabet: Comparative Statement**

1	2
Devanagari Alphabet finalised by the Lucknow Conference 1953.* 28/29th November 1953.	**Devanagari Alphabet as accepted by Government of Madhya Pradesh†**
1. The Alphabet—	**1. The Alphabet—**
(*a*) *Vowels*(1)‡—	(*a*) *Vowels*(1)—
अ आ इ ई उ ऊ ऋ ॠ ऌ ए ऐ ओ औ अं अः	अ आ इ ई उ ऊ ऋ ए ऐ ओ औ अं अः
(*b*) *Matra* (*Vowel-marks*)—	(*b*) *Matra* (*Vowel-marks*)—
(*i*) The matras will remain same except short 'इ' sign i.e. ि (3 अ).	(*i*) The current style of the matras shall remain the same. (3)
(*ii*) The short 'इ' sign may be written on the right (3 ब).	(*ii*) Even in case of short 'इ' sign the current method will continue, i.e. कि and not की. (3)
(*iii*) The short 'इ' sign may be in the same style as long 'ई' sign, except that the vertical stroke should end off halfway as ी in की (3 इ)	
(*c*) *Consonants*(1)—	(*c*) *Consonants*(1)—
क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ	क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ ड़ ढ़
(*d*) *Figures*(1)—	(*d*) *Figures*(1)—
१ २ ३ ४ ५ ६ ७ ८ ९ ०	१ २ ३ ४ ५ ६ ७ ८ ९ ०

*Reform of the Nagari Script, Government of Madhya Pradesh, Languages Dept.
† *Ibid.*, p. 30. ‡ Figures in parenthesis refer to the sequence of rules in the original authorities referred to above.

3	4
Revised Hindi Alphabet as accepted by the Ministry of Education, Government of India G. C. F. 4-7/57-H. 2, dated 21st January 1960	**Marathi Alphabet as accepted by the Education Department, Government of Maharashtra** E & S.W.D./TBK. 1762-G, dated 20th July 1962
1. The Alphabet—	**1. The Alphabet—**
(*a*) *Vowels*—	(*a*) *Vowels*—
अ आ इ ई उ ऊ ऋ ऌ ए ऐ ओ औ अं अः	अ आ इ ई उ ऊ ऋ ए ऐ ओ औ अं अः
(*b*) *Matra* (*Vowel-marks*)—	(*b*) *Matra* (*Vowel-marks*)—
ा ि ी ु ू ृ े ै ॅ ॉ	ा ि ी ु ू ृ े ै ॅ ॉ
(*c*) *Consonants*—	(*c*) *Consonants* —
क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल व श ष स ह ळ क्ष ज्ञ ड़ ढ़ श्र	क ख* ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म य र ल* व श* ष स ह ळ क्ष ज्ञ श्र
(*d*) *Figures*—	(*d*) *Figures*—
१ २ ३ ४ ५ ६ ७ ८ ९ ०	१ २ ३ ४ ५ ६ ७ ८ ९ ०
Explanation : 'ऋ' does not occur in Hindi, therefore it is not included in the list of vowels. (1)	

* *Vide* G.R. देनाक 1060-म dated 24th Sept. 1966.

1

2. Conjuncts—

(*i*) Conjuncts may be constructed in two ways (5)

(*a*) in case of consonants having vertical stroke, by deleting the vertical stroke (5-1) ;

or

(*b*) by placing *halant* sign below the first consonant (5-2).

(*ii*) *Other Consonants* (5-2)

(*a*) The current method of forming conjunct letters should be continued in the case of 'क', 'फ' and 'ह'.

2

2. Conjuncts—

(*i*) Consonants with vertical stroke (Khadi Pai):

ख ग घ च ज झ ञ ण
त थ ध न प ब भ म
य ल व श ष स क्ष ज्ञ

(*ii*) When conjunct letters are to be formed from consonants mentioned above, they may be made by deleting the vertical stroke and not by adding *halant* (4 अ),

i.e. उत्तर, मज्जन, गन्ना, इत्यादी (Not उत्तर, मज्जन गन्ना or उत्तर, मज्जन, गन्ना).

(*ii*) *Other Consonants* (4 आ)—

(*a*) The present method of forming conjunct letters in form of 'क' and 'फ' be continued, *e.g.*

संयुक्त, दफ्तर (and not संयुक्त दफ्तर).

(*b*) Conjunct letters without verti-bar ङ, छ, ट, ठ, ड, ढ and द may be formed by adding *halant* mark (The oblique stroke below a consonant) (4 ई), *e.g.*

गठ्ठा, बुड्ढा, विद्या
(not गठ्ठा, बुड्ढा, विद्या).

3

2. Conjuncts—

(*i*) Consonants with vertical stroke (Khadi Pai) (2) :

ख ग घ च ज झ ञ ण
त थ ध न प ब भ म
य ल व श ष क्ष ज्ञ

(*ii*) When conjunct letters are to be formed from consonants having vertical stroke the vertical stroke shall be deleted (2) :

ख्याति, लग्न, विघ्न, कच्चा, छज्जा, व्यञ्जन, नगण्य, कुत्ता, पथ्य, ध्वनि, न्यास, प्यास, डिब्बा, सभ्य, रम्य, शय्या, उल्लेख, व्यास, श्लोक, राष्ट्रीय, स्वीकृत, यक्ष्मा।

(*iii*) *Other Consonants*—

(*a*) The present method of forming conjunct letters from 'क' and 'फ' be continued (3क), *e.g.*

संयुक्त, पक्का, दफ्तर (and not संयुक्त, पक्का, दफ्तर).

(*b*) Conjunct letters ङ, छ, ट, ठ, ड, ढ and द may be formed by adding *halant* mark (The oblique stroke below a consonant) (3 ख), *e.g.*

वाङ्मय लट्टू, बुड्ढा, विद्या
(not वाङ्मय लट्टू, बुड्ढा, विद्या).

4

2. Conjuncts—

(*i*) Consonants with vertical stroke (Regh) (1) :

ख ग घ च ज झ ञ ण
त थ ध न प ब भ म
य व श ष स क्ष ज्ञ

(*ii*) When conjunct letters are to be formed from consonants having vertical stroke, the vertical stroke shall be deleted :—

ख्याती, लग्न, विघ्न, कच्चा, सज्जा, माझ्या, व्यञ्जन, नगण्य, सत्ता, पथ्य, ध्वनी, न्यास, प्यादे, डब्बा, सभ्य, रम्य, शय्या, व्यास, श्लोक, राष्ट्रीय, स्वीकृत, यक्ष्मा.

(*iii*) *Other Consonants*—

(*a*) The following method of forming conjunct letters should be continued in the case of

'क' 'फ' : (2 क) *e.g.*

संयुक्त, लफ्फा.

(*b*) Conjuncts of the consonants 'ङ, छ, ट, ठ, ड, ढ, द, ल, ह, and ळ' (except in case of ल) shall be formed, if necessary, by adding *halant* mark. In case of ल they shall be formed according to the present method. When these consonants combine with य the *three-fourth* य can be used (2 ख) :

e.g. वाङ्मय, खट्टू, अड्डा, विद्या, पाल्य, गोळ्या अगर गोळ्या etc.

1	2
	(*c*) The old forms of र in conjunct letters be continued to be used. (4 उ) नम्र, गर्व, राष्ट्र, श्रीमान्, पत्र (and not नम्र, गर्व, राष्ट्र, श्रीमान्, पत्र).
	(*f*) Conjuncts from 'ह' may be written in the present style or by using *halant* mark. (4 इ) चिह्न और चिह्न (but not as चिह्न).
4. (1) The *shiro-rekha* (Head-line) should be continued to be used. (2)	4. (1) The use of *shiro-rekha* (Head-line) may be continued. (2)
(2) (*a*) The following punctuation marks in use in English may be accepted, except full-stop and colon. (4 क) - — , ; ! ?	(2) (*a*) The punctuation marks, except fullstop, may be accepted as in English. (6) – — , ; ! ?
Use khadi pai (।) for full point. (4 ख)	For fullstop (.) vertical stroke (।) shall be used. (5)

3	4
(*c*) The old three forms of र in conjunct letters be continued to be used (3 ग), i.e. प्रकार, धर्म, राष्ट्र.	(*c*) The present form of र in conjunct letters may be continued to be used as before (2 ग) : प्रकार, धर्म, राष्ट्र, वैज्याने. The short and long Ukars of र, can however be written as रु, रू.
(*d*) The form of 'श्र' as it appears in 'श्री' may be retained.(3 घ)	(*d*) The form श्र in 'श्री' be retained. (2 घ)
(*e*) The conjunct letter त्र made from त and र be written as त्र. (3 ङ)	
(*f*) Conjuncts from 'ह' may be written by using *halant* mark as in the current method. (3 च) चिह्न और चिह्न (but not as चिह्न)।	
(*g*) *Sanskrit conjunct letters may be written in the old style.* (3 छ)	
4. (1) The use of *shiro-rekha* (Head-line) will be in force. (4-1)	4. (1) The *shiro-rekha* (Head-line) should be continued to be used. (3-1)
(2) (*a*) The punctuation marks, except full-stop, may be accepted as in English. (4-2फ) . — , ; । ? ! : The colon sign (:) may be used for *Visarg*. (4-2 फ) For fullstop (.) vertical stroke (।) shall be used. (4-2 ख)	(2) (*a*) The following punctuation marks may be adopted (3-2 क) :— . — , ; ! ? :

1

(*b*) As far as possible following signs may be provided for on the keyboard of the Typewriting machines (4ग) :—

. / ॰ % " " ( )

+ × ÷ * = †

The suggestion to drop one of the two forms (॑ ॒) of *Anuswār* Nasal Mark and *Anunāsik*, Nasal Consonant may not be accepted. (6)

Note.—The decision regarding the style of numerals shall be subject to the provisions in the Constitution.

2

(*b*) As far as possible the following marks may be provided on the keyboard of Typewriting machines. (7अ):

. / ॰ % " " ( )

+ × ÷ * = †

(*c*) The sign (॑) may be introduced in place of (॑) for the conjuncts ॠ ॣ etc. (7आ)

(*d*) The rounded design of *Halant* may be altered to short oblique (॒). (7इ)

(*e*) The ॣ in *Rashtra* sign (॑) may be made by joining (॑) with (॒) (7ई)

Two forms of *Anunāsik*, Nasal Mark and Nasal Consonant ॑ ॒ may be continued to be used. (8)

3

(*b*) As far as possible the following marks may be provided on the keyboard of Typewriting machines. (4–2 ग):—

॒ ॑ . % " " ( )

+ × ÷ * = ॑

Two forms of *Anunāsik*, Nasal Mark and Nasal Consonant (॑ ॒) may be continued to be used. (4–3)

4

(*b*) As far as possible the following signs may be provided for *mechanical and hand composition* and on the keyboard of Typewriting machines. (3–2ख) :—

॒ . " " ( )

+ × ÷ = ॑

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3. Krishnaji Vithal Soman, *Biography of Pandurang Javji Choudhari*, J.P., Nirnaya-sagar Press, Bombay, 1941, page 22.

4. *See* reference 1 above.

5. Bhau Shastri Lele. *Masik Manoranjan*, Vol. XX, Part 2, No. 236. February, 1915, pp. 139-145.

6. *See* reference 3 above.

7. देवनागरी लिपीसुधार समितीका विस्तृत विवरण Known as *Narendra Dev Committee Report*, Education Department, Government of U.P. (1949). Lucknow, *Samvat 2006*.

8. *Report of the* "लिपि सुधारणा समिति" (*Script Reforms Committee*) Government of Bombay, Govt. Central Press, Bombay, 1949.

9. Government of Bombay, Education Department, Resolution No. SCR 1154, dated 20th September 1954.

10. *Reform of the Nagari Script*, Government of Madhya Pradesh, Languages Department, 1955.

11. *See* reference 1 above.

12. Vinoba Bhave " शिक्षण-विचार व लोकनागरी लिपी " pages 225-248.

13. Government of India, Ministry of Education, letter No. F. 4-7 57-H. 2, dated 21st January 1960.

14. Government of Maharashtra, Education and Social Welfare Department, Resolution No. TBK 1762-G, dated 20th July 1962.

15. *See* reference 3 above, p. 23.

16. *Athavani ani Akkyaika*, S. V. Bapat, Vol. III, 1928, page 158.

CHAPTER XIV

MECHANICAL AND PHOTO-COMPOSING MACHINES

296. Before we examine the current methods of setting Devanagari on the mechanical composing machines, it will be worthwhile considering the features of the type-setting machines both mechanical and photographic and their limitations. There are two types of mechanical composing machines. On one of them single types are cast and on the other complete lines or slugs are produced. The Monotype Composing Machine is representative of the first type, while there are two types of Line-composing Machines, one is Linotype and other the Typograph. There is another machine known by the name Ludlow on which slugs are cast from matrices set by hand.

MONOTYPE COMPOSING MACHINE

297. The Monotype machine was invented by Talbert Lanston in 1887. The basic features of this machine were determined by 1893. Bancroft, Lanston's colleague, is responsible for designing (in 1899) the form of the Keyboard and the Caster which they still retain. The Monotype machine comprises of two separate units, one of which is the Keyboard and the other a Composition Caster. These machines are manufactured in England by the Monotype Corporation and in the U.S.A. by Lanston Industries Incorporated, Philadelphia. The Keyboard has two Keybanks with keys for letters, signs, etc., and also Justification Keys. When a key on the Keyboard is pressed, it causes a bar in the intermediate frame to move up carrying two traverse bars with it. They operate two vertical bars which open the plunger valves. Compressed air released by the valves raises two pistons which in turn drive two pins through paper ribbon, 4.5/16″ wide (*Fig.* 110) mounted on the tower.* The ribbon is moved by means of transport holes on both edges, with which the toothed wheels engage and move it 1/8″ at every stroke. The series of the perforating holes are divided into two groups. Those on the left are identified with letters A to O and on the right, are marked with 1 to 15. Every letter is represented by two holes, one from each group, indicating the exact position of the letter-matrix on the matrix frame (*Fig.* 108). As

See Plate 101.

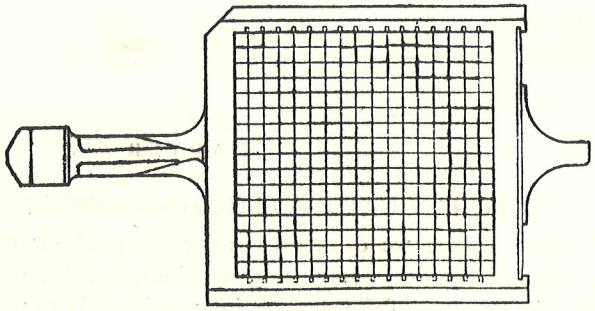


Fig. 108. **The Monotype Extended Die-case.**

The Unit-Shift Attachment is fitted as standard on the composition casters. Two different unit values can now be mixed in most rows of the matrix-case while preserving the correct unit value in casting the type

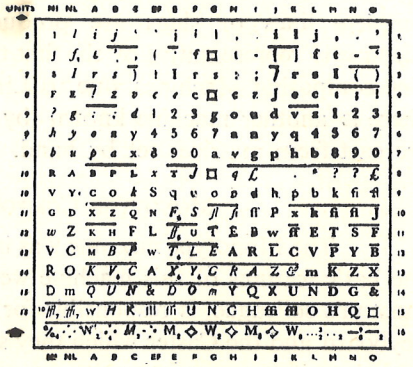


Fig. 109. **Matrix-case arrangement 7949.**

[*Note*—Heavy rule above the character indicates unit-shift. The unit value in this case is that of the row above.]

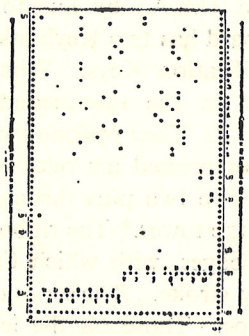


Fig. 110.
Perforated paper ribbon.

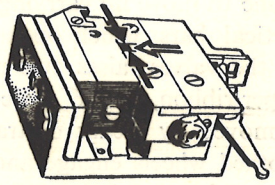
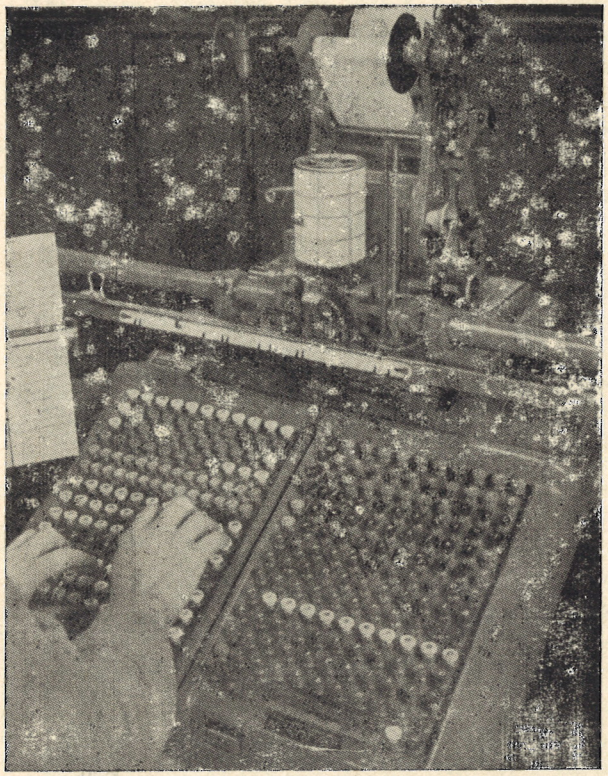
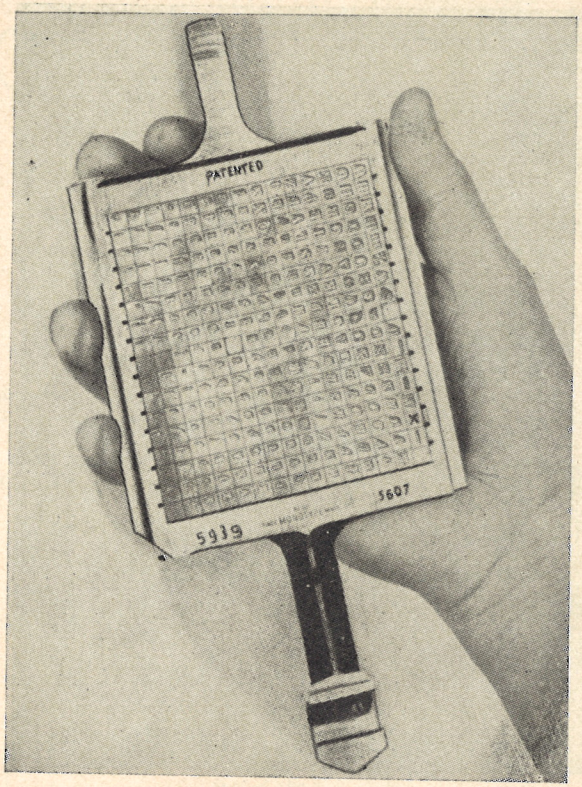


Fig. 111. **Monotype composition mould.**



Monotype keyboard : Paper tower, Justification unit and Keybanks.

PLATE 101



Monotype Matrix-frame

PLATE 102

the holes are being punched on the ribbon, the *set* or the thickness of the letter is registered in units in which the square quad in the Monotype system is divided.

298. The space which the type would occupy is registered by the turning of the unit wheel. A small unit rack (*Fig. 112*) rises at the depression of each key and engages the unit wheel which has been rotated by compressed air on release by the retaining of the pawl. The movement of the pointer on the scale corresponds to the width of the letter in units. At the end of the line, the justification drum which is a ready-reckoner (*Plate 104B*). indicates two numbers. The numbers are selected by the horizontal movement of the drum and the vertical movement of the space indicator, which raises one row of figures at every strike on the space-band. The operator then presses corresponding justification keys on the key-board from two rows. Each combination of the justification keys indicates a specific width of the space which is inserted between the words to justify the line on the caster.

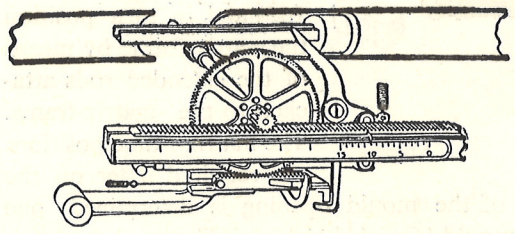


Fig. 112. **The unit scale and wheel**

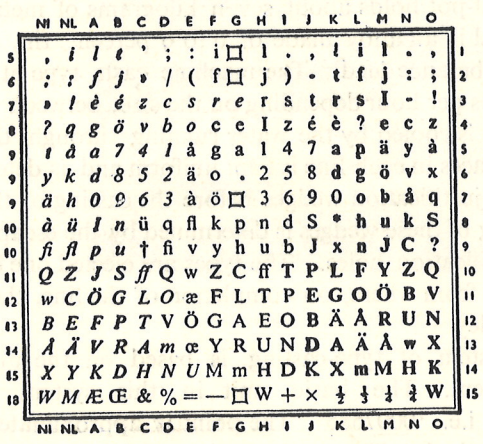

NI NL A B C D E F G H I J K L M N O
5 , i l t ' ; : i□ l . , ł i l . ,
6 ; : f j » / (f□ j) - t f j : ;
7 » l è é z c s r e r s t r s I - !
8 ? q g ö v b o c e I z é è ? e c z
9 t đ a 7 4 1 å g a 1 4 7 a p ä y à
9 y k d 8 5 2 ä o . 2 5 8 đ g ö v x
9 ä h 0 9 6 3 à ö□ 3 6 9 0 o b å q
10 à ü I n ü q fl k p n d S * h u k S
10 fi fl p u † fi v y h u b J x n J C ?
11 Q Z J S ff Q w Z C ff T P L F Y Z Q
12 w C Ö G L O æ F L T P E G O Ö B V
13 B E F P T V Ö G A E O B Ä Å R U N
14 Å Ä V R A m œ Y R U N D A Ä Å w X
15 X Y K D H N U M m H D K X m M H K
18 W M Æ Œ & % = — □ W + × ¼ ½ ¾ ⅛ W
NI NL A B C D E F G H I J K L M N O

Fig. 113. **Matrix arrangement**

299. The perforated ribbon is mounted on the Tower (*Plate 104C*) of the composition caster which is worked by electric power. The matrix-frame contains 15 rows of 15 matrices each made of hard bronze. The extended matrix-frame (*Plate 102*) contains fifteen rows of seventeen matrices each. Out of the 255 matrices, four are for casting spaces. Each type-matrix is engraved with a character in recess (*Fig. 114*). The compressed air passing through the perforated holes of the paper ribbon and through the copper pipes raises the stop-pins

in two blocks positioned on the caster at right angles. The block at the rear of the mould has seventeen pins marked A to O, N1 and NL while the block on the left has fifteen pins marked 1 to 15. The raised pins stop a pair of tongs (*Plate 103*) and in turn position the matrix-frame by means of the extended rods attached to the matrix-frame. The matrix-frame positions the required letter on the mould opening. The extent of the mould opening is determined, one way by the body size of the mould (*Fig. 111.*) which is fixed and the other way by the set-width of the letter concerned, which varies with the letters. This opening to the set-width is determined by the movement of the set-wedge or normal-wedge which is caused by the escapement of the air from one of the holes numbered 1 to 15. The matrix is held by the centre pin in position while the metal is pumped and the type is cast.

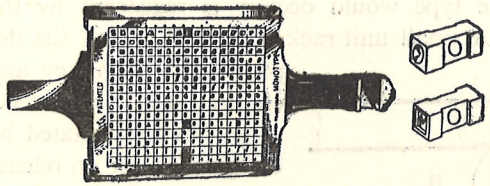


Fig. 114. **Matrix Frame** **Matrices**

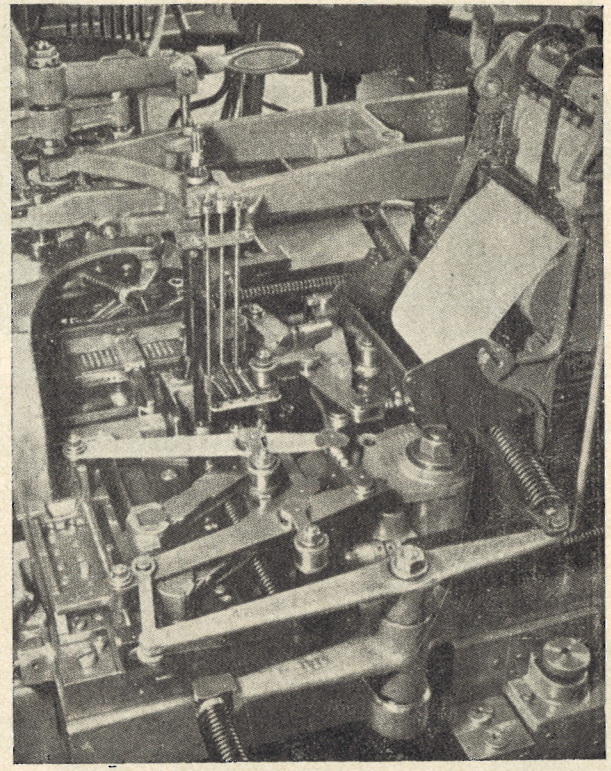
300. The Monotype metal-pot holds about seven kilograms of metal. Monotype composition metal is an alloy made of 6 to 9 percent tin, 15 to 19 percent antimony and balance lead. The machine casts type at a speed of 6,000 to 11,000 types per hour depending on the size, between 14 pts. and 5 pts. The cast type is cooled by the water running through the mould. The width of the spaces in each line is kept uniform and is determined by movement of two justification wedges before the casting of the line begins. The positioning of these wedges is determined by the escapement of air through the justification holes. The types are ejected one by one and pushed in a channel from where, on completion of the line, they are transferred on to the galley.

301. The Monotype system of type-casting is based on the unit system of type measurement. The basic unit in this system is one-eighteenth of one point, i.e. ·0007685″. The point is approximately one-seventy-secondth of one inch. The basic unit multiplied by the 'Monotype Set' is the unit of that *face*. The set sizes in the Monotype system range from 5 to 26, graduating in quarter sizes. Twelve-set em is 12 point or 0·166″.

12 Set = 0·166″.

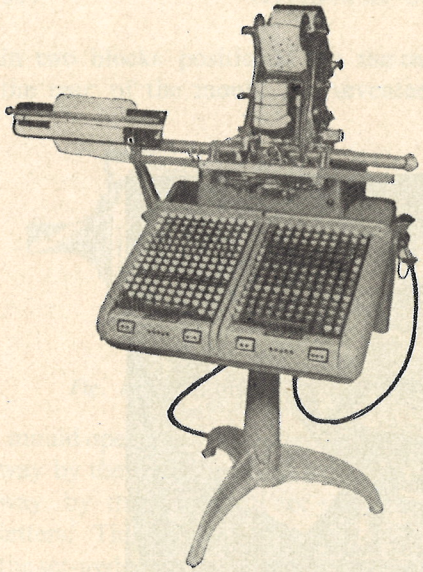
1 Set = 0·166″ ÷ 12 = ·0138333″.

One unit of 1 Set = ·0138333 ÷ 18 = ·0007685.

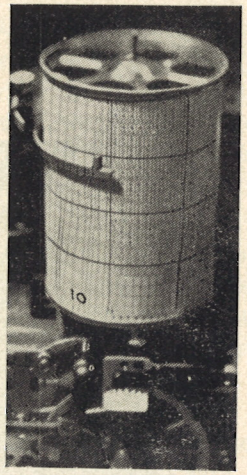


Monotype Composition Caster : Tongs and Stop-pin Block

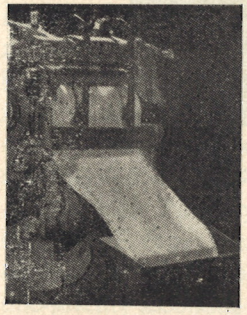
PLATE 103



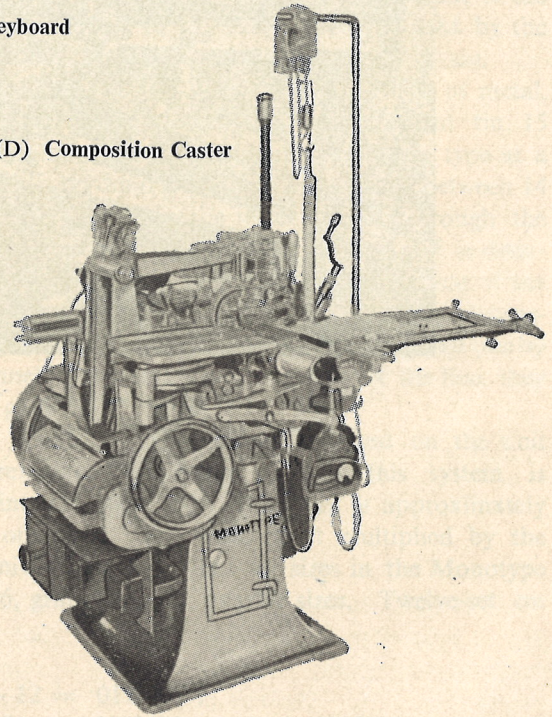
(A) Monotype Keyboard



(B) Justification Scale

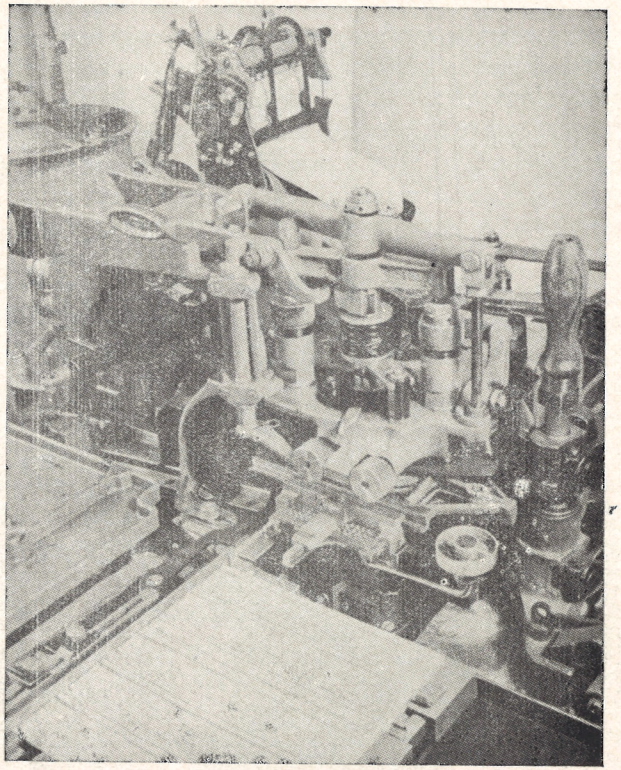


(C) Paper tower



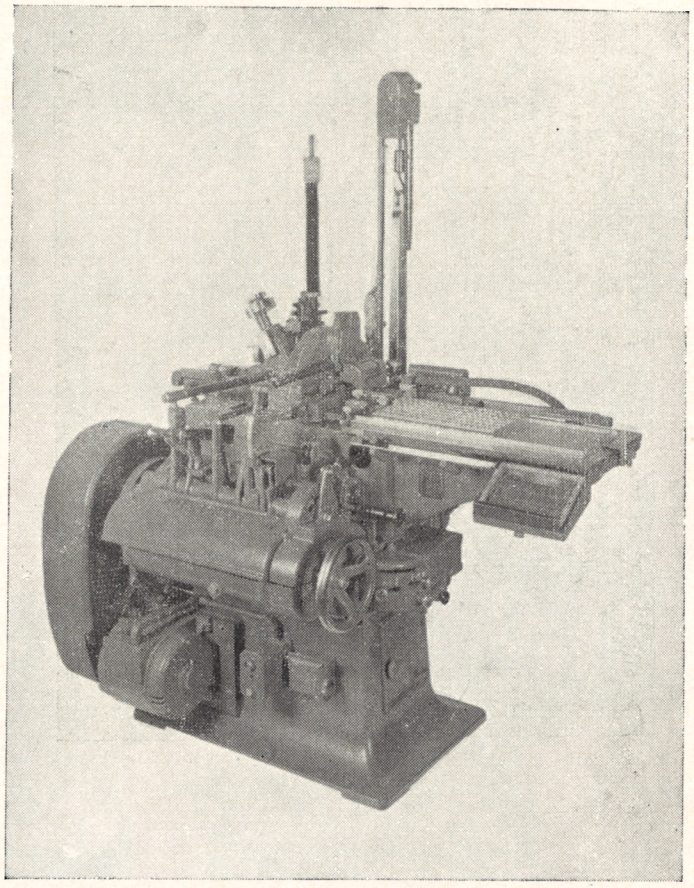
(D) Composition Caster

PLATE 104



Monotype Composition Caster : Bridge Pump and Galley

PLATE 105



Monotype Super Caster

PLATE 106

To find the unit of any set, the fundamental unit (·0007685) is multiplied by the set-width of the type as given in points.

1 unit of 8 set = ·0007685 × 8 = ·006148.

1 em (18 units) of eight set = ·006148 × 18 = ·110664 say ·1107.

The caster attendant has to set the measurement of em quad of the fount accurately, so that the required width is correct to 1/10,000th of an inch. If this is not done, the set-measure of the lines will be irregular.

302. Seven Roman alphabets can be set on the modern Monotype machine from the same keyboard and cast from one matrix frame :

ROMAN CAPS, Roman Lower case and SMALL CAPS.

ITALIC CAPS and *Italic Lower case.*

BOLD CAPS and **Bold Lower case.**

SLUG-COMPOSING MACHINES

303. There are two makes of the slug-composing machines currently on the market. One is the Linotype and the other is Intertype. The main features of both are the same. Identical slug-composing machine is also available from the U.S.S.R. The Linotype Machine is designed for setting and casting in continuous ' lin(es) o(f) ' types (Linotype) known as slugs. It was invented by Ottmar Mergenthaler in 1886. *The Tribune Book of Open Air Sport* was the first work set up on this machine at the office of the New York Tribune. Regular manufacture of this machine was takenup later. The Machine was put on the market in U.S.A. in 1890 and in Europe in 1894. It is now manufactured by the Mergenthaler Linotype Company, Brooklyn, in U.S.A., and by the Linotype and Machinery Co., Altrincham, in U.K. Linotype machines are widely used for printing newspapers and they are also being used on a large scale in America for book work.

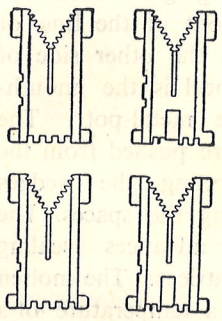


Fig. 115. **Linotype Matrices.**

LINOTYPE MACHINE

304. The Linotype Machine consists of three main parts: (1) Composing mechanism for assembling the matrices in lines, (2) Casting mechanism to cast the slugs, and (3) Distributing mechanism for carrying the matrices to their channels in the magazine. The Linotype main Keyboard consists of 90 keys. Each key is connected with a channel in the magazine containing matrices, which are rectan-blocks, measuring 14 mm. × 32 mm (*Fig. 115*). The thickness of the matrices varies according to the set-measure of the letters engraved on

them with the side walls. Matrices are supported by two ears at the upper end and two lugs at the bottom end during their travel. The upper part is given an angular cut in the middle with teeth to correspond with the projections on the distributor-bar. The type character is stamped, 1·05 mm. deep, on one of the edges of the matrix body. Two letters are stamped on each duplex matrix—Roman and *Italic* or Roman and **Bold**.

305. The magazine in which the matrices are steered is kept inclined so that the matrices may slide by gravity. Touching a key on the key-board pulls out the pawl's front tip positioned at the bottom end of each magazine channel. The lowest matrix is thus released. Movement of the next matrix is arrested by the rear tip of the pawl moving up through the hole in the channel at a little higher position. Matrices released from the channel, travel on a revolving belt up to the assembler-box, where they are positioned erect by the star-wheel. After each word a special key is struck which discharges a steel space-band made of two inter-linked wedges. When the matrices fill the assembler box, the operator ascertains that the remaining space is not more than that which could be filled in by expansion of the wedges in the space-bands. The operator then raises the assembler-box to a position where the line is received by two fingers and pushed by a spring and lever to the left side of the machine into the first-elevator.

306. The first-elevator descends, with the line of the matrices, into two vice-jaws, held apart equivalent to the length of the line measure. The mould-wheel turns quarter of a revolution bringing one of its four moulds in front of the line of matrices. On the other side of the mould-wheel is the mouth-piece of the metal-pot. The spacebands are pushed from the bottom, operating the wedges and expanding the spaces. The mould-wheel advances, sealing the line of matrices. The molten metal kept at a temperature of a 550°C is pumped into the mould. The mould-wheel then recedes and makes three-quarters of revolution during which movement the back of the slug is plained off by the knife and cleaned by a wiper. The slug then comes to the ejecting position, from where it is ejected through two parallel

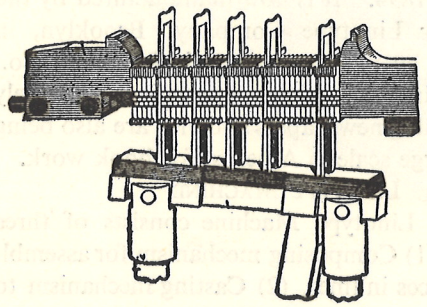


Fig. 116. **Assembled line of Linotype Matrices in the Vice Jaws.**

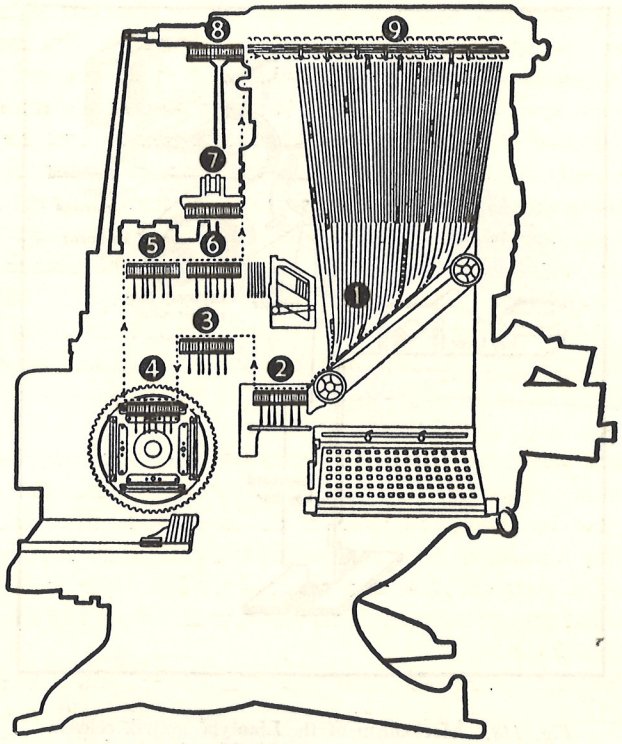


Fig. 117. **Linotype machine operating parts**

1 Matrices leaving the Magazine
2 Assembler Box
3 First Elevator
4 Mould Wheel with a line of Matrices
5 Matrices ready for transfer to the Second Elevator
6 Second Elevator
7 Matrices being lifted to the Distributor Box
8 Distributor Box
9 Distributor Bar

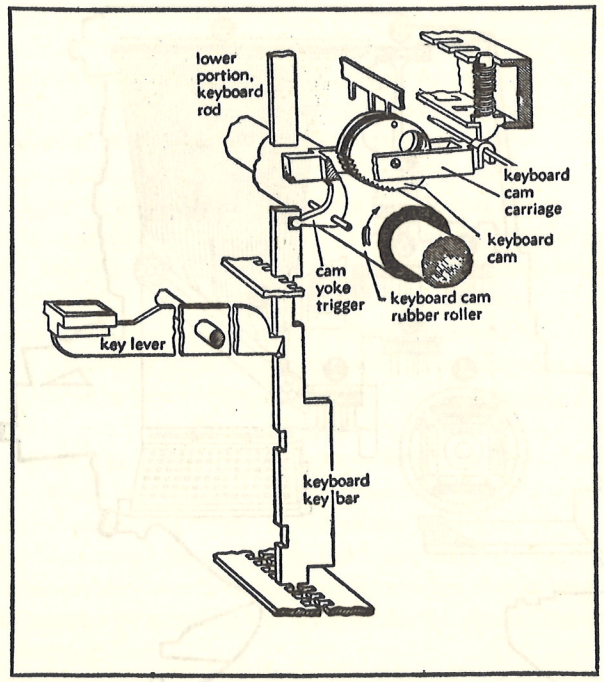


Fig. 118. **Mechanism of the Linotype matrix release**

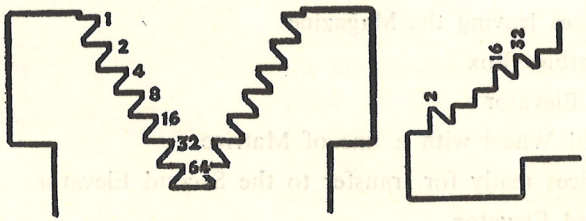


Fig. 119. **Matrix teeth for selection**

[**Note :** To find the channel number, add the number of the uncut combination teeth and subtract 2. The remainder gives the channel number which is 48 in this case.]

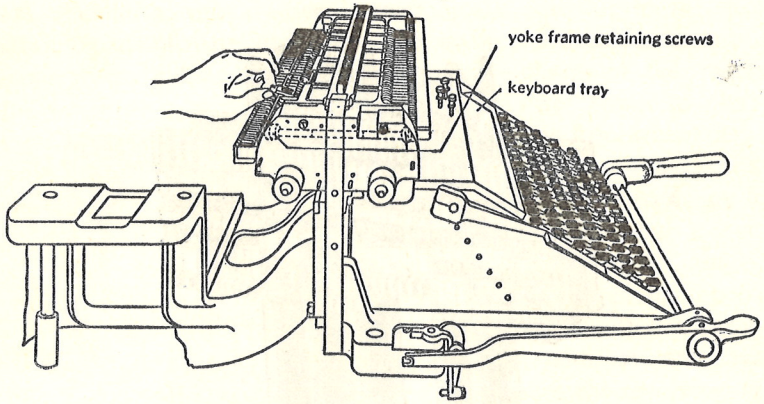


Fig. 120. **Linotype Keyboard swung out**

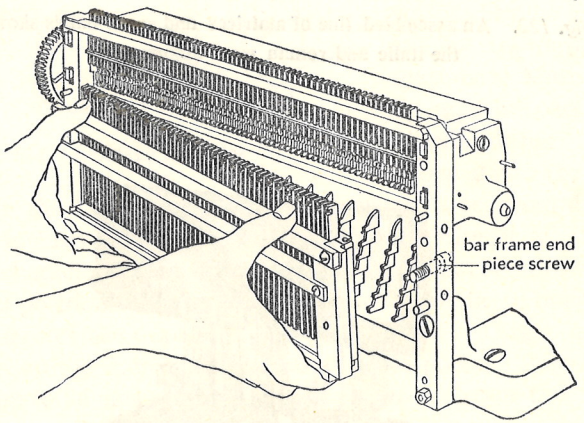


Fig. 121. **Key-bars on the Linotype**

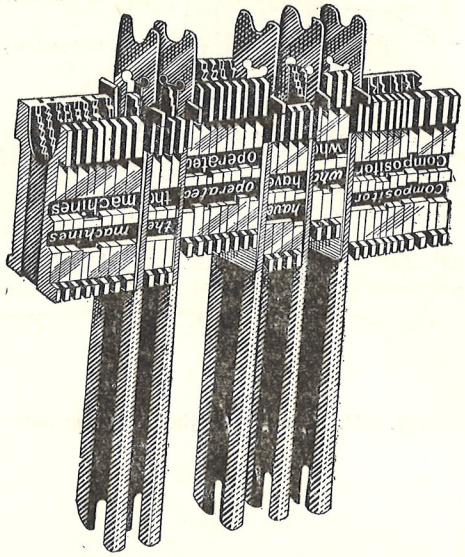
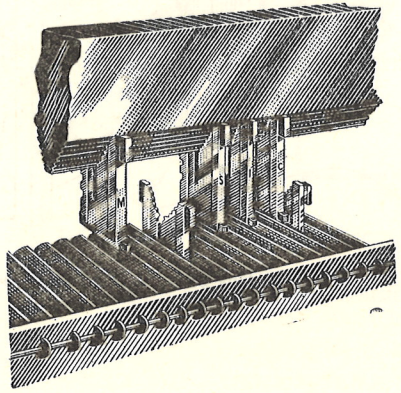


Fig. 122. **An assembled line of matrices and space-bands showing the italic and roman word alignment.**



Eig. 123. **A position of Matrix distributor showing matrix release.**

knives, out into the galley. These knives trim the slug on both sides to the exact body-size.

307. While the mould-wheel is carrying the cast slug to the ejecting position the line of matrices is carried up, by the matrix-lift to the transfer channel where a long lever descends to take charge of the matrices. It lifts them to its top position from where they are pushed on to the distributor-box. The matrices are lifted one by one by a vertical finger moving up and down and delivered to the distributor-bar with seven grooves. The matrices are carried through the revolving spiral rods and dropped into the magazine-channel at the positions, where the grooves in the bar are cut to correspond with the teeth on the matrix. The space-bands are not lifted by the second elevator, but are pushed into the space-box. Matrices inserted by hand are carried over the distributor-bar and are dropped into the pie-stacker.

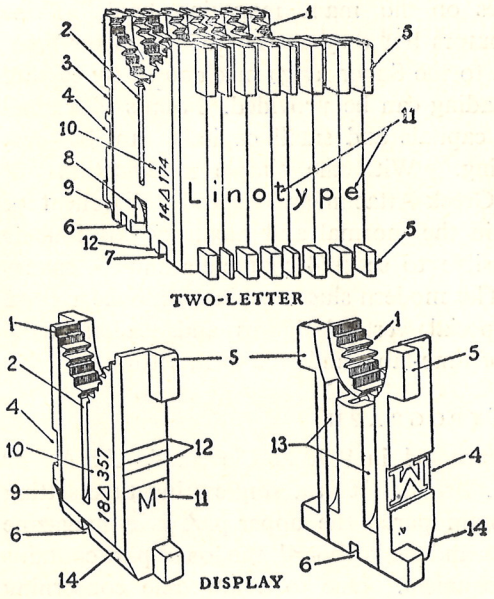


Fig. 124. **Linotype Matrices**

308. On the Linotype machines text matter is set from $4\frac{3}{4}$ points to 14 points inclusive, in a range of type faces. Almost all the matrices carry two characters. The most used face is Roman or normal character. The second position on the matrix is utilised for italic or bold face. The signs and figures are duplexed with Small-caps. Larger display faces are also set on the Linotypes in sizes up to 48 points. Set-measures are available up to 36 ems on the Linotypes. On Intertype the set-measure is available up to 42 ems. By the use of different matrix-founts various combinations of alphabets are available on a single machine as follows :–

Roman with *Italic* and SMALL CAPS *or*
Roman with **Bold** and SMALL CAPS *or*
Bold with ***Bold Italic*** and SMALL CAPS.

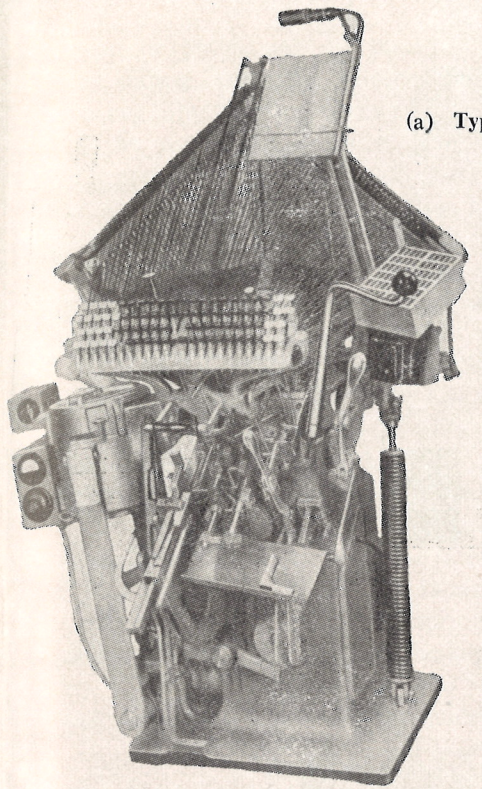
809. On the mixer type slug composing machines (Linotype 70 and

70 SM and Intertype F and F-SM) with double distributor-bar any four matrix-founts making eight complete faces are under keyboard control without magazine replacement. With the addition of side magazines (up to four) an alphabet of single letter matrices in 18 point to 36 point capital and lower case and 42/48 point capitals becomes available. Super-range machines (Linotype 72 and Intertype G) carry 90 channel text and 72 channel display magazines on the main magazine bank. These machines have double distributors but they are not of the mixer type. Side magazines can be added to the Super-range machines. By casting the slugs on larger bodies leading can be provided. Founts with small ascenders and descenders or capitals and small capitals can be cast on smaller body for close fitting. With the simple modifications of the assembler-box, called 'Greek Attachment' speedy alignment of different characters pushed in the normal and auxiliary positions is effected, which makes it possible to set 174 characters and 3 spaces from the main keyboard. The modern slug machines produce a good range of tabular work. Special vertical figures and leaders make available a wider coverage of time-table and rule-form setting.

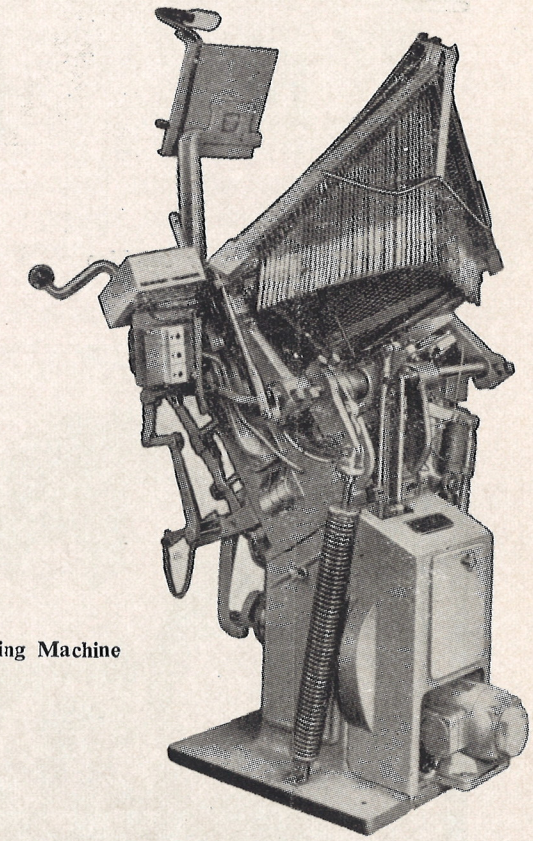
TYPOGRAPH

310. Typograph was constructed in 1890 at Cleveland, U.S.A., by John R. Rogers and Fred E. Bright. It is a slug-casting type-setting machine consisting of two main parts, the upper part is a magazine unit comprising of the matrices and the keyboard, the lower part contains the spacing and casting mechanism. Due to a law case concerning its patent which was lost, the Typograph could not be built in America and its manufacture was transferred first to Canada and then to Germany (Loewe and Co., Berlin, now the Typograph G.m.b.H.). There some details were altered, and early in the present century a large number of machines were installed in Europe. In 1908 a two-letter matrix was devised, and in 1914 the Universal model appeared with facilities for the rapid exchange of matrices and moulds and in 1928 the mould was improved.

311. The Typograph keyboard contains eighty-four keys arranged in a manner similar to those on a standard typewriter. As the keyboard is placed rather high the operator has to stand at the machine. Behind the keyboard, on a higher plane, is a frame from which guide-wires descend to a point of junction below the keyboard. At the upper end of the wires hang the matrices consisting of steel shanks with eyelets, brass bodies bearing the characters. Bold letters and



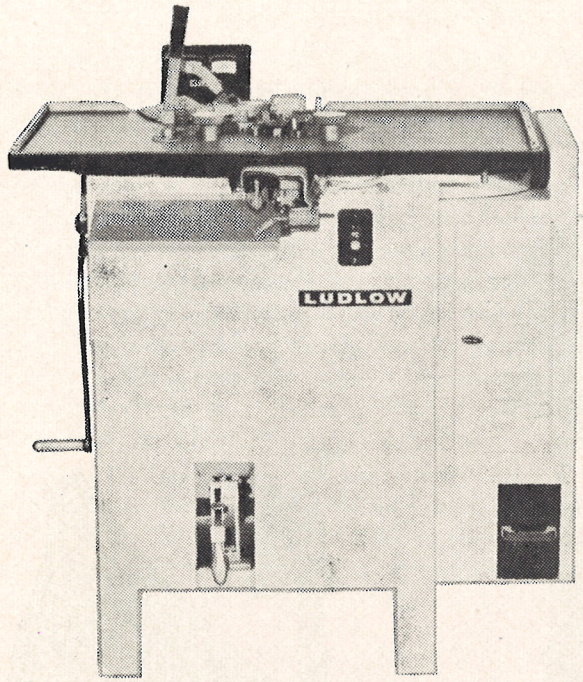
(a) **Typograph Slug-casting Machine**
(Front View)



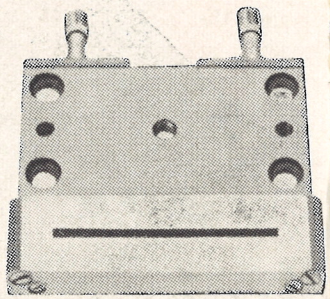
(b) **Typograph Slug-casting Machine**
(Rear View)

H 5447–25A

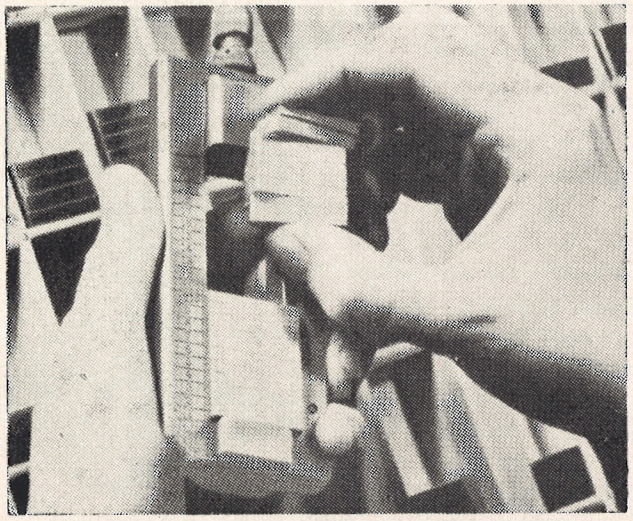
PLATE 107



(a) Ludlow Machine



(b) Ludlow Mould



(c) Ludlow Stick

PLATE 108

roman or gothic, can be mixed at will. The matrices are prevented from sliding down the guide wires by blocking forks. The depression of a key lifts its corresponding fork and releases a matrix down a wire into the assembling channel, while the remaining matrices of the same letter are held back by a rear blocking fork. By striking a spacing key, a spacing ring, a disc with a tapered edge is released. A wedge-shaped tongue is connected with the disc which has a square hole. Spacing rings slide on a square axle. When the line of types and spaces is almost complete and the casting mechanism has been started, the matrix line is held between two jaws while a rail guides them into line. The square axle turns the spacing rings, thereby increasing the spaces between words until the line is justified. The mould, supported by levers, now swings forward towards the matrix line, and a metal plate shoots in between the metal-pot and the mould, into which the metal is now pumped in a single stream.

312. After casting, the Typograph slug is already finished and need not be trimmed with knives at the sides or the base. The jet is broken off slightly above the base by the intermediate plate, after which the line is pressed out of the mould by spring pressure and is drawn to the slug galley, situated in front, under the keyboard. Slugs and hand-set matter can be mixed in the galley. The matrices are distributed by tipping backwards the frame with the guide-wires.

Ludlow Slug-casting Machine

313. The Ludlow Typograph Co. founded in Chicago in 1906 developed the type-casting machine devised by Washington I. Ludlow. The model was improved upon in 1911. The Ludlow caster is a semi-mechanical slug-casting machine. Brass matrices set by hand in a rectangular stick and spaced are cast in solid lines or slugs on the Ludlow machine.

314. When the matrices are assembled and the stick is made up by tightening the screw provided on the side, it is put in a groove on the top of the caster and locked in position. The machine is then set in motion which automatically moves and brings the mould against the line of matrices, the pump operates, a slug is cast, trimmed and ejected in the galley in about four seconds. The slugs can be repeated. Rules can be cast on this machine as a continuous operation. After the slug is cast the stick is removed and the matrices distributed. Over-hangs at the top or bottom are possible on Ludlow. With angular matrices sloped italics can be set up. In case of the over-hangs, supporting type-high slugs are required to be cast and placed in position.

The Bhisotype

315. The *British Printer* in its September 1908 issue reported : " Unlike any other casting or composing device on the market, the Bhisotype is the invention of an Indian gentleman and Professor S. A. Bhisay, has thus set up a new record. Coming from India, with the admittedly highly skilled ingenuity of his race, it would appear that he is working on original lines right through. The possibilities of the Bhisotype are probably very great. " Bhisotype was universally acclaimed as " an appliance that is conceived on entirely original lines and that has several novel and original features ", as recorded by the *British and Colonial Printer.* It was entirely different in its construction to the Linotype, Monotype, Stringertype, Wicks or other of its predecessors. The Bhisotype did not require movable matrices to assemble and distribute as in Linotype, a perforated paper strip and complicated diecase moving mechanism as in Monotype ; or any bulky revolving wheel with pumps and chain as in Wicks which were the principal mechanical devices in use at that time. *The Inland Printer* (August 1908) described the advent of Bhisotype thus : " A surprise is about to be sprung on the trade in the form of a new type-casting and composing machine, which even in its initial stage, seems to bid fair to prove a formidable competitor to the existing appliances. "

The Spasotype Machine

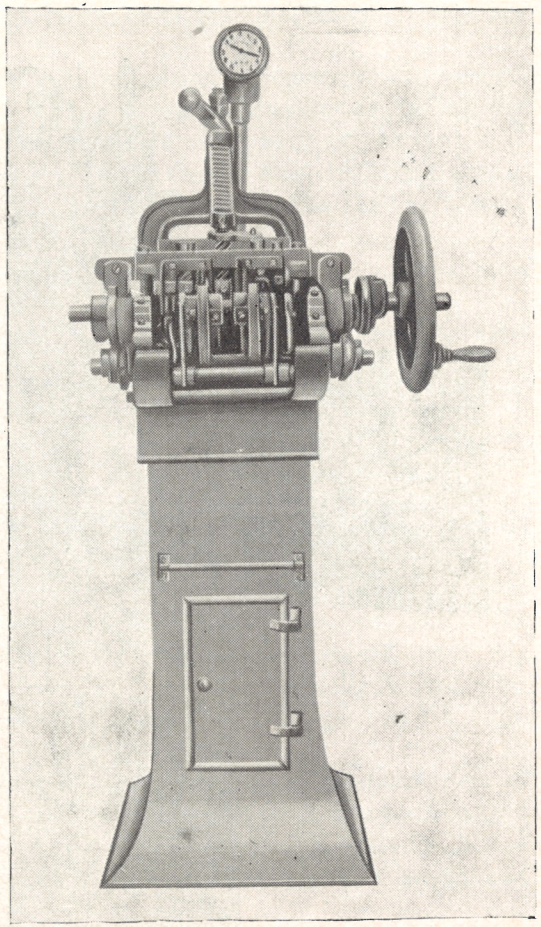
316. Bhise's Type Casting and Type Composing Machine was invented in 1901 and a provisional patent (No. 24506 dated 2nd December 1901) was granted. Hughes Son and Company, the patent agents, remarked in their report on Search, dated 30th January 1902, that in their Search of previous patents they did not find " any specification that has any way anticipated.—

(1) Peculiar construction of the matrices having flexible stems and adopted to cast therefrom a properly justified line of selected letters of words either in *a bar or single types.*

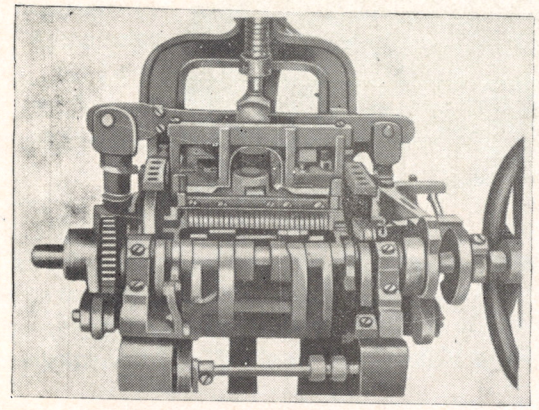
(2) Arrangements of parts by which the selected matrices are assembled and brought in alignment and made to resume their normal position without requiring any distribution.

(3) Space-bars having flexible stems and the arrangement of parts by which the selected one is brought in or taken out of action automaticaly.

(4) Temporary letter spacing pieces and the arrangement of parts by which they are automatically brought in or taken out of action to form a line bar or single types.

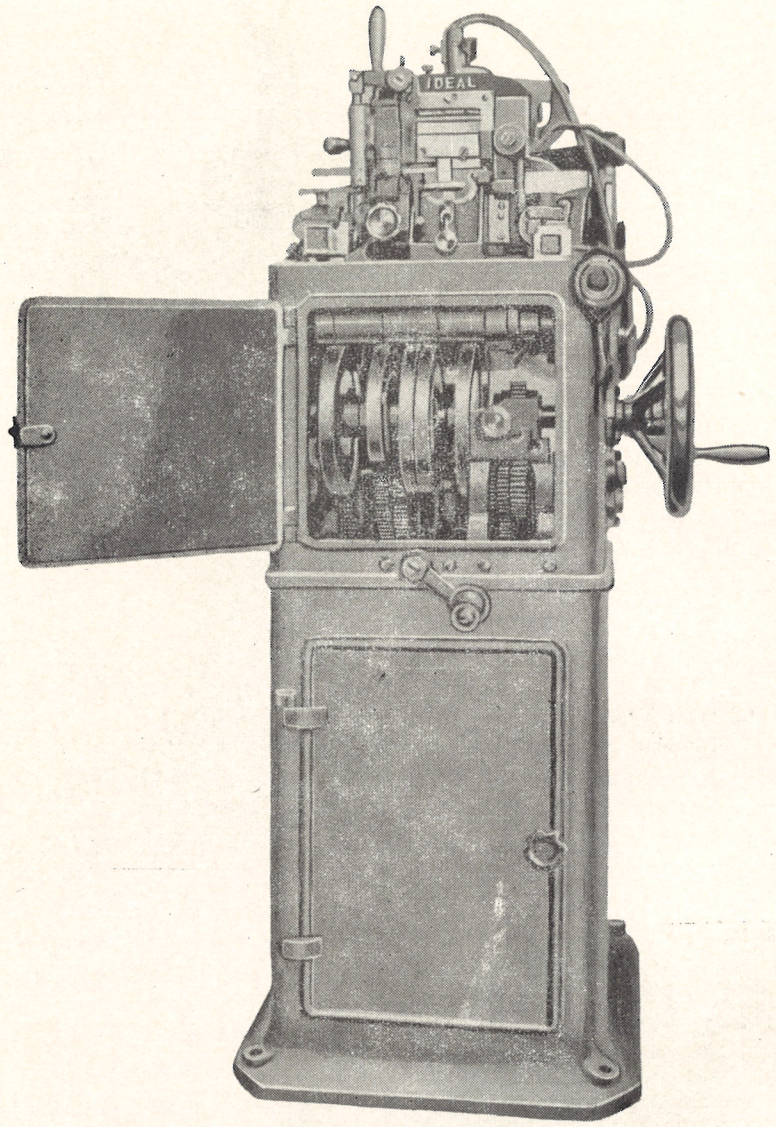


(a) **Bhise Type-casting Machine**



(b) **Arrangement of Multiple Mould**

PLATE 109



Bhise Ideal Type Caster

PLATE 110

(5). Construction of the mould wheel and arrangement of its various adjusting parts adopted for water circulation opening or closing the cavity automatically and forming a nick in the body of the type.

In the prospectus issued by Mr. A. N. McGray in June 1902 the machine is referred to as ' Spasotype '. It was expected to cost £250 as against the Linotype then costing £1200 and selling at £3200.

Special Feature of the Spasotype

317. The Spasotype machine had four groups of mechanism, Adjusting Board, Temporary Changing Matrix Frame, Type casting Mechanism and the Key-Board and was designed to set a line of selected matrices from which a line of justified types could be cast. It was also possible to cast set up matter in types as in Monotype or individual types on a Foundry caster. The hand-out issued for private circulation also claims " Owing to the interlocking parts the matrices could be adopted to cast Eastern Languages types requiring intricate accents below or above the line. Four lines of set-up matrices were in one operation at a time and the machine could produce 15,000 to 20,000 ens per hour. The special features of this machine as given in the hand-out issued, are :

(1) Compact size, less power required, automatically formed nick, requires only one-sixth of the superficial space occupied by the Linotype.

(2) No complicated series of teeth for purposes of distribution of matrices and avoids spoilage of matrices. The space-bars are arranged under the line of matrices and a proof can be taken while the line of matrices is proceeded on the matrix adjusting board, in advance of the casting of the line.

(3) No air compressor is required nor the use of punching ribbon. Complete set of alphabets could be cast in one operation. The matrix frame being detachable the same could be interchanged.

(4) Lastly the versatility of the machine is claimed to be in its multi-purpose use for casting slugs for newspaper, composed pages of individual types ready for book work and separate letters for foundry.

Bhisotype Casting Machine

318. The Multiple Casting Machine was invented in 1905. Bhise later founded the Bhisotype Ltd. and produced the first machine in 1908. The famous *Caxton Magazine* said " that a native of India should produce results which the most able Engineers of the world have so far failed to accompalish ". This invention brought to Bhise the Membership of the

Society of Engineers of London and Fellowship of the Society of Science, Letters and Arts, London.

319. The ' Bhisotype ' was a multiple type-casting and mechanical type-composing device, consisting of two separate machines one for casting types and the other for setting them mechanically. The basic machine was mounted on a plate 18 inches by 20 inches. It was 21 inches high, provided with 30 small type-casting moulds. The standard machine could work with 60 moulds and was only 9 inches wider.

320. The casting machine had a rectangular sliding block on which was mounted L-shaped uncovered moulds in a line. A sliding top plate placed in position completed the series of moulds. Each of the 30 moulds had a projection which facilitated extracting the type from the mould. Metal was pumped in from a single plunger pump into the moulds, through a front plate having a ridge, to form a groove at the foot of the types. The other ends of moulds were sealed with the matrices mounted on a frame attached to the sliding cover plate. The moulds had one or two projections in the body to provide the nicks at the required positions. The moulds were kept cool by water circulating through the mould block and the cover plate.

321. During working, the moulds on the blocks were closed by the cover plate by a novel pressure device, pushed forward by cams and brought in contact with the mouth of the spout. The powerful plunger pump operated forcing the molten metal in all the moulds, simultaneously casting 30 separate types, one in each mould. The mould block was then drawn back from the spout, the tails under each of the types were broken off by a special arrangement leaving grooves on the types. Types were removed from the moulds on a turning platform by a coverplate provided with ' extruding projections '. The types could be conveyed to a table for automatic assembling into founts or to the magazines of one or more Bhisotype Composing Machines.

322. The moulds provided on the Bhisotype were made of two pieces fixed together to form an L-shaped rectangular slot varying in size according to the ' body size of the type proposed to be cast. Each mould occupied only $\frac{1}{4}$ inch for types up to 12pt. making the total length of the mould plate to $7\frac{1}{2}$ inches only. The matrices were made of rectangular copper blocks on which were punched deep steel letters. They could also be made by the electrotyping or ' battary method '. Matrices could carry two deep punchings as in case of Linotype duplex matrices. Each of the matrices was on a pre-fixed unit width, which determined the set size of the types with a common body governed by the corresponding mould

slot sizes . The matrices could be grouped together to cast logotypes, line-bars or slugs, by insertion of a plain block of the length required. Change-over to other body-size was effected by substitution of the appropriate L-shaped mould-piece only, and the top cover plate was common to all sizes. The moulds on Bhisotype were so constructed that the matal inlets automatically increased in size for larger bodies allowing larger quantities of metal and thus insuring solid bodies. The machine made only forty revolutions per minute as compared to 80 to 100 revolutions of ordinary type-casters and 140 upwards of the Monotype composition caster, but could cast 60 types per revolution increasing the output to 2,400 types per minute.

Bhisotype Composing Machine

323. The Bhisotype Composing Machine was a simple device consisting of a magazine with 90 chambers each of which held 10 types at a time. The chambers were connected with the respective keys on the keyboard, similar in design to that of a type writer. The chambers were connected with the Bhisotype Caster by a travelling chain effecting automatic supply of fresh types. One Bhisotype Casting Machine could supply types to ten composing machines at a time. The keyboard operator of the Bhisotype Composing Machine had to set the lines by operating the keyboard and by releasing a lever, shifting the line to a specially built compartment. The line was automatically justified and transferred to the galley without disturbing the setting operations. A complete Bhisotype unit of one caster and ten composing machines was then (1908) expected to cost only one-fifth of the cost of Linotypes or Monotypes capable of producing identical output.

Tata Bhise Inventions Syndicate

324. Professor Bhise had thus succeeded in inventing a novel device for mechanical typesetting, which was considered superior to the then existing mechanical composing machines. He was however unable to arrange for its commercial production and had to join the Tatas to form the " Tata Bhisey Inventions Syndicate ". He had to drop the manufacture soon owing to difference with the directors of the Tatas. This proved very unfortunate particularly for the Oriental languages. The sponsors of the Bhisotype had claimed " The peculiar construction of the Bhisotype mould and its method of operation are admirably adopted for casting types or characters of any of the Oriental languages with all their intricacies. The inventor has given special attention to this. It is impossible to cast

and compose such types (with combination accents) by existing machines.

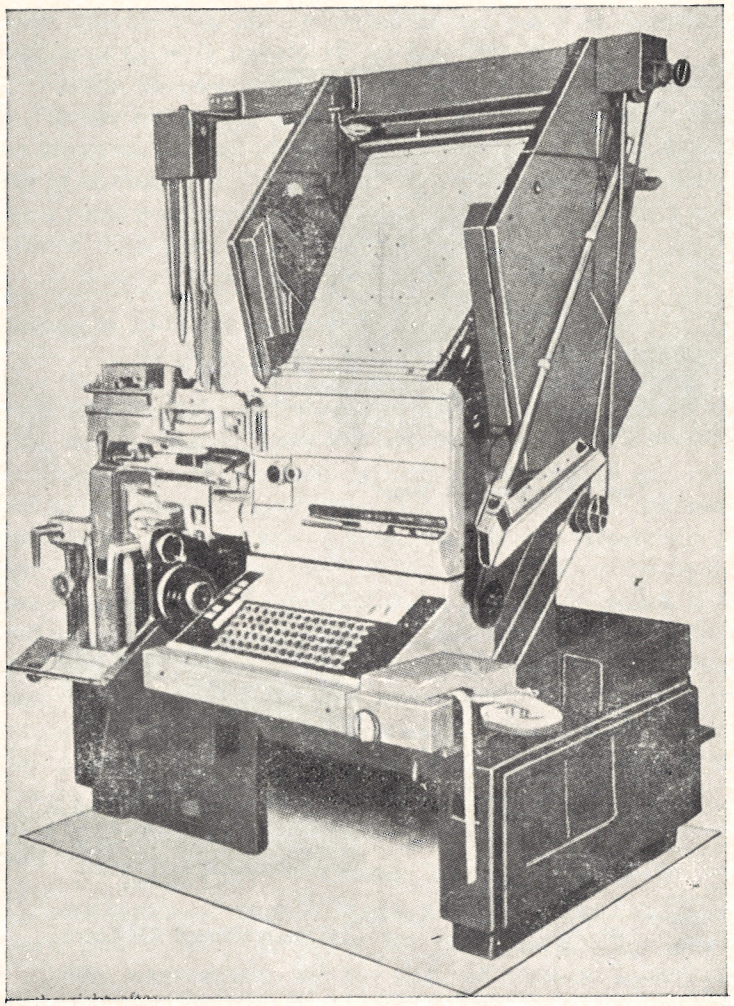
325. Bhise had realised that his Multiple Type Caster was more useful to the type founders and it was not popular with printers. He tried to meet the requirement of average printer with his invention of Universal mould for single type caster in 1914. His machine designed to cast type was then considered the simplest with only 250 parts against 600 parts of the Thomson Caster, 1,000 parts of the Universal Caster and over 1,500 parts of the Monotype Caster. The Bhise Ideal Type Casting Corporation was founded in 1920. Mr. W. Ackerman, the Linotype Engineer, has remarked " He (Bhise) has now solved a problem which had been the dream of type machine inventors for many years.....and no doubt would be welcomed by the trade as the solution of many of the problems now connected with the commercial use of typecaster. "

T.T.S. Linotype

326. Speedier slug-casting machines (70 Series Linotypes) have now been manufactured by removing the mechanical limitations to the speed. They are provided with high-angled magazines which permit extra fast flow of matrices. The mechanical speed of T.T.S. (Model 79) and Comet 300 Linotype is variable from 8 to 12 newspaper lines of 12 em pica in 8 pt. per minute (17,000 to 26,000 ens.).

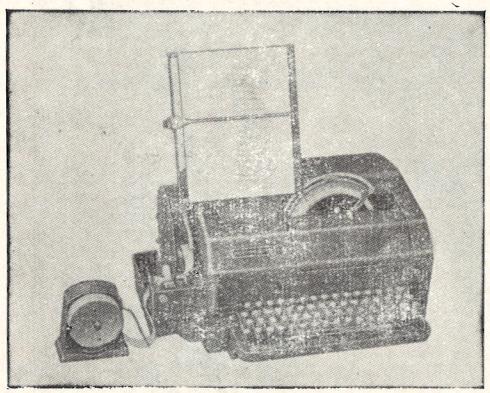
327. Electron is the fastest line-casting machine of the single distributor type with four magazines. The improvements incorporated in it include uninterrupted assembly of matrices and their straight line travel, eliminating use of assembling elevator. All the controls are centralised for the benefit of the operator. The new design of the improvements of the keyboard height permits more restful posture reducing the operator fatigue. The machine can be provided with six moulds in place of usual four moulds. With this improvement it is possible to set 15 newspaper lines (32,000 ens) per minute, subject to the ability of the operator. With such tremendous speed the limiting factor is only the operator's performance and for full utilization of the machine capacity, it is necessary to feed a perforated tape.

328. The perforated tape is required to be justified. This can be done manually by an operator setting at a special Tape Perforator. Automation in slug composition is introduced with the Multiface Perforator, a desk type electrical typewriter, producing a six hole 7/8″ wide code tape, which is fed to the Linotype machine. Additional keys are provided on the keyboard for fixed spaces, ligatures and odd characters. The different combinations of the holes provide for all the keyboard

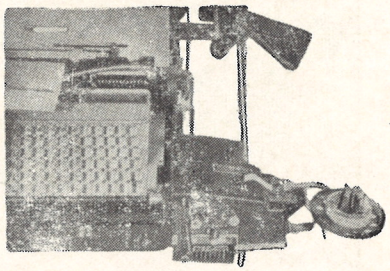


Fastest Lino Casting Machine : T.T.S.

PLATE 111



Tape perforating Key-board



Tape perforated Key-board

PLATE 112

characters in Roman with italics and small caps or Roman with bold face. The perforator provides for type size 4 ¾ pts. to 14 pts. Counting magazines inserted into the perforator do the work of recording the brass-widths of the style and size of the type characters tapped.

329. For the purpose of calculation em quad is divided into 32 units. The thin space, point and comma have eight units and tolerance in these measures is ·003″. A quad on the T.T.S. is measured in decimals of an inch as is done on the Monotype caster. For example, " taking a required measure of 12 pica ems, set in 8 pt. of a true 8 pt. set width of ·1107″, the working will be :

$$\frac{12 \text{ ems.} \times 12 \text{ points}}{8} = 18 \text{ ems of 8 pt.}$$

working to the decimal method :–

$$\frac{12 \text{ ems} \times \cdot 166''}{\cdot 1107''} = 18 \text{ ems of 8 pt.}$$

A deduction of ·2 of the em is made from the total scale measure for tolerance, thus the true setting on the perforator scale will be 17·8 ems.*

330. Correction can be made by super-imposing of the rub-out code of six perforations super-imposed on the incorrect perforations. Perforated and justified tape is then fed to the Operating Unit attached to the adapter-keyboard on the right side of the operator. The operating unit reads the perforations in the tape by means of sense pins and actuates the key-lever releasing the matrices, raising them to second letter position and sending in the lines. When the control lever is turned off the Linotype can be operated manually. The perforated tape can be fed into a transmitter-distributor, which translates the code into electric impulses for transmission on overhead wire or by radio to the re-perforator at the receiving end. The accuracy of the tape perforation can be checked by using a page printer.

Photo-Composing Devices

331. Introduction of photo-setting is a fundamental change in the composing process as it eliminates hot metal composition and produces a film transparency for printing. It may be interesting to compare the new process of photo-setting with the traditional process of composing with hot metal. Photo-setting machines are expensive, particularly the ' Lino-film ' and the ' Lumitype '. However once the machine is installed the process needs less capital outlay, because metal is not required and it is not necessary to keep the type standing for reprints. Type metal is expensive, and average weight of a page is about 3 kilograms. A tonne of metal is locked up in about 300 pages. A large

*Martin, E. T. ' Teletype Setter ' *Print, India* May 1963.

quantity of metal is, therefore, required when the hot-metal process is used, particularly when it has to be kept standing for books which are likely to be reprinted, technical and educational books, for example, the type of which may also need to be corrected for new editions. A great deal of storage space is also required for storing the standing types. The space required for 250 pages of negatives, when a book is photo-set, is much less than that required for ten pages of type.

332. The versatility of photo-setting is greater than that of the hot-metal setting. It eliminates completely type-casting, imposing, proving and all camera work. The product of the photo-setting machine is two-dimensional as against three-dimensional types produced by the mechanical composing machines. Photo-composing makes the work in the printing press quicker, cleaner and simpler. By changing the adjustments of the machine the distance between film and matrix can be altered, which means that the size of the type is almost infinitely variable, as against the fixed-size point system used in the hot-metal setting. Photo-setting is developing extensively in the western countries and is likely to be introduced in this country on a large scale in the near future. The photo-setting machines fall into two categories. The first category is of the machines developed by adapting the existing type-setting machines, i.e., Foto-setter and Mono-photo. The second category is a complete departure from the design of the existing type-setting machines. The machines in this category are the Lino-film and the Photon or the Lumi-type which make use of electrical and electronic techniques.

Intertype Foto-Setter

333. The Foto-setter is a photo-composing machine manufactured by the Intertype Co. It employs the same principle of circulating matrices as in the hot-metal composing machine. The Foto-setter matrix, known as Foto-mat, carries a photograhic negative embedded in its side in horizontal position. In all other respects the Foto-mat is identical with the ordinary matrix. The mats are assembled in the box, the same way as is done in the hot-metal machine. They are then pushed to the photographic section located in place of the hot-metal slug casting mechanism and are held on a carriage rack. The line-length is measured and the remaining space is distributed over

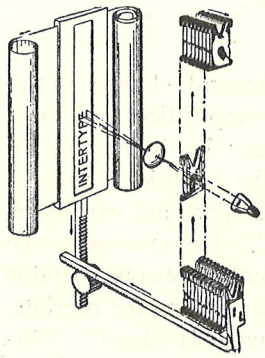


Fig. 125. **Photographing of Foto-mats.**

the entire length. The mats are lifted one after the other to a position in front of the light beam, held them firmly stationary by a positioning slot and the images of the letters embedded in them are photographed on the positive film. As a mat is lifted the next mat takes its place and the rack moves by the distance equivalent to the width of the mat lifted. This causes the film to move the exact distance, identical with the set width of the letter, as determined by the brass-width of the mat, and makes room for the next image to be recorded. The spacing is obtained by adjusting the micrometer film-fed dial. The exposed mat is lifted to the second elevator.

334. Exposed film is removed for developing in a light proof-receiver. The corrections are carried out by cutting the portion of the lines involved and pasting the corrected strip on special Intertype Foto-setter correction device. The product of the Foto-setter is, right or wrong reading film negative or positive and right reading paper positive, ready for plate-making. The Foto-setter is equipped with four magazines with 114 characters. Modern Foto-setters are equipped with a lens-turret which contains up to 14 different pre-focussed lenses. Fourteen type-sizes 3 pt. to 72 pt. can thus be photographed from one magazine. The maximum measure is 51 ems. About 240 faces are available on the Foto-setter.

Roto-Photo

335. The Roto-photo machine was invented by George Westover in 1948. It consisted of 4 units:

(1) Standard Monotype Keyboard ;
(2) Single-character projector to replace hot-metal casting equipment on the Composition Caster ;
(3) Proofing Projector ;
(4) Make-up Projector.

The Roto-photo made use of the Mono-type paper-spool perforated on the standard keyboard. The paper spool is mounted on the caster and the air, passing through the perforations, positions the master-negative which has taken the place of the matrix frame. The master-negative is a sheet of glass contained in a holder closely resembling the normal Monotype matrix frame. The facility of changing the matrices is not available. Different master-negatives are required for different sizes. The camera photographs the image on a 35 mm. film. The light source is a 60 watt lamp projecting downwards from the centre-pin position. Camera moves to set the lines and columns. It is loaded with 10 feet roll of 35 mm. film. For 12 pt. type in 24 em set measure the image size on the 35 mm.

film is only 3·6 pt. body size. Spaces are recorded after each word by the movement of the camera. Exposing time is one-fifteenth of a second. Camera can be adjusted to move right to left, according to the requirements. Set-size can be increased by using 60 mm. film. The speed on Roto-photo is 120 types per minute or 7,200 ens per hour. The film is put on the proofing projector where each line is projected and printed on sensitised photostat paper, in the form of galley slips, at a speed of 60 to 100 lines per minute. Corrections are then made and a corrected film is produced. Unit of correction is a complete line.

336. In the make-up machine the lines are enlarged, and projected to the required size from the original. Corrected lines are similarly enlarged and projected from the film of corrected lines, in position. Headlines etc. are also separately set and projected in position in the make-up projector. The speed of the make-up projector is 20 lines per minute. The product of this machine is a roll film of positive or negative transparencies of made-up pages up to 24 ems set measure and in type sizes 5 to 14 pts. Roto-photo was an experimental machine. It is not now in manufacture.

MONO-PHOTO

337. Mono-photo Film-setter unit comprises of the standard Mono-Keyboard and the Film-setter to take the place of the Composition Caster. The film-matrix case has 255 caracters and spaces, all of which are separate and can be replaced individually. One set of matrices covers 8 pt. to 24 pt. Another set is required for setting type, smaller than 8 pt., in body size, while a third set is required for sizes larger than 24 pt.

Diagram of the optical system.

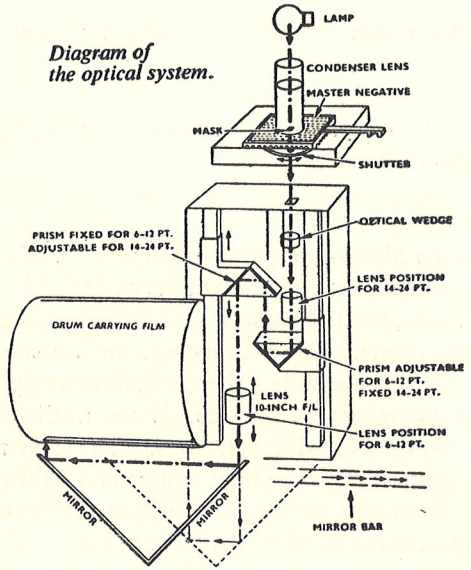
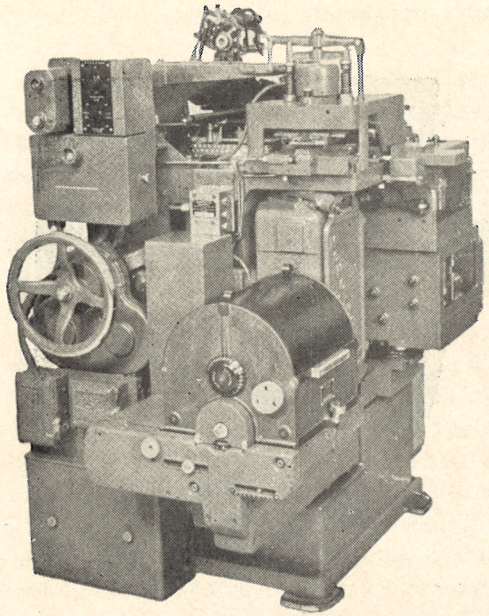
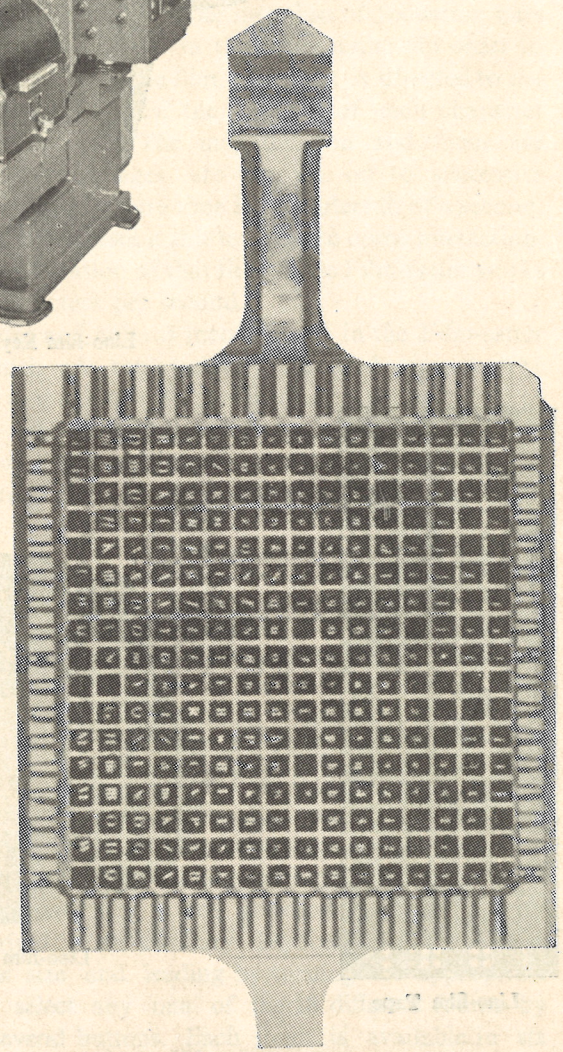


Fig. 126. **Optical system of Mono-photo.**

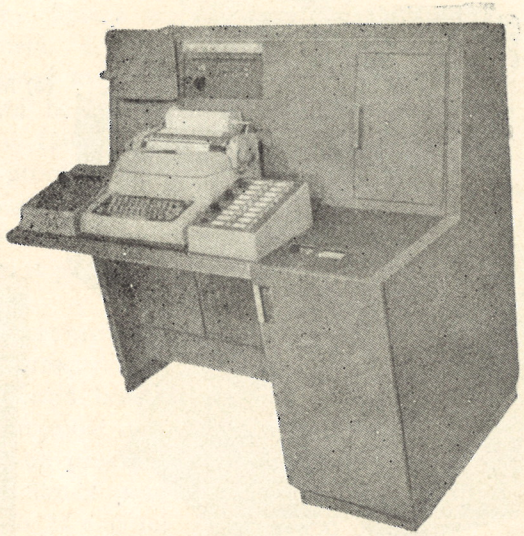


(a) Mono-Foto

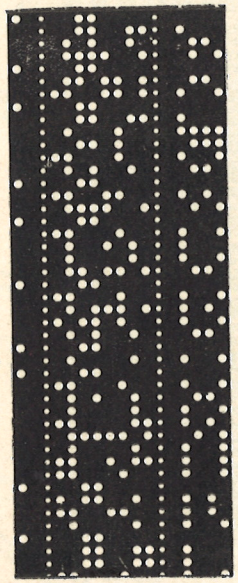


(b) Mono-Foto Negative Case

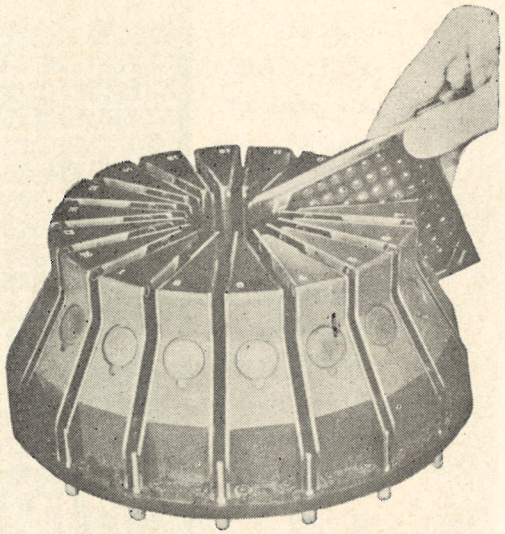
PLATE 113



Lino-film Keyboard Unit



Lino-film Tape



Lino-film Fount Grid

PLATE 114

338. In the Film-setter the mould, metal-pot and galley portion are replaced by the photographic unit. Light from a head lamp-type of bulb is directed by a condenser to give an equal distribution of illumination over the whole area of the selected characters in the film matrix case. As the path of the light is projected from the matrix to the drum unit, it is folded up by prisms. The positions of the prisms and lenses are variable, to give the signal focus for whatever degree of magnification required. This is done by the insertion of focussing bars of pre-determined length. The film is in the drum unit. In order to make a line of successive images on the film, the light is directed to the horizontal axis, which moves laterally, the distance of each character width, after it has been exposed. The magnification and focus are preserved while the character-images are thrown on to successive positions on the film. Normal exposure time is one fifteenth of a second. The signal of killing of a line causes a shutter vane to come into action, to obscure the light for the duration of that line. The Film-setter works with a speed of three characters per second.

339. The principle of set and units is incorporated in the Film-setter without the wedges, which are replaced by racks and pinions. The film is eleven inches wide and can take 60 ems measure. It is attached to the drum which moves. While one drum is in operation the other can be unloaded or reloaded with film or in the dark room. Corrections are made by stripping out error lines and the freshly re-tapped lines are set on the stripping film.

Lino-Film

340. Lino-film is a photo-composing machine. It does not make use of the circulating matrices like the Foto-setter. It provides for the make-up functions. Lino-film installation consists of the following :

(1) Lino-film Keyboard Unit. (2) Lino-film Photographic Unit.
(3) Lino-film Corrector. (4) Lino-film Composer.

The first unit is a keyboard which is like that of an ordinary typewriter. By depressing the keys a spool of paper is perforated, and at the same time a typewritten record is produced. The Lino-film keyboard is very different from the Monotype keyboard. It is more like the console of an organ. There is one standard electric keyboard with 44 keys. On the right is an auxiliary keyboard which provides for the selection of point size and leading by turning the appropriate dial. The operator can select any one of the 18 different founts by depressing one of the several buttons. Each fount is available in six

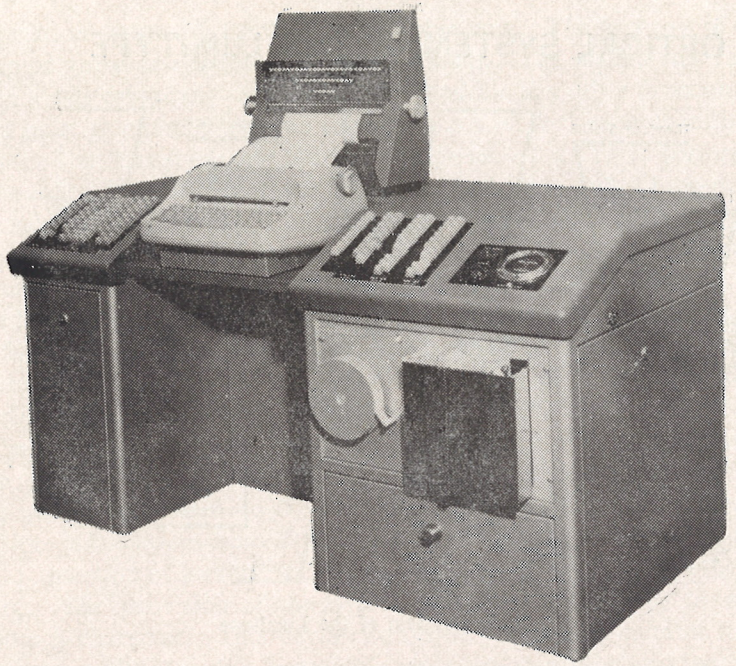
different point sizes, making a total of 108 different faces and sizes. On the left of the keyboard is a panel, controlling the machine functions, i.e. quad right, quad centre, quad left, justify and line erase. Justification is done by pressing a button. A line can be tried without perforating a tape.

341. The tape is then fed into the Photo-machine, which is very large. It contains many electronic circuits and works very rapidly, faster than the eye can register. The machine sets the matter as recorded on the tape, changing type-size, leading, founts and so on. Lines up to 30 ems, and in point sizes 5 to 18, can be set at a rate of fifteen newspaper lines per minute, i.e. approximately 50,000 characters per hour. The photo unit contains 18 fount grids. Each grid is a piece of glass, partly transparent and partly opaque, containing 88 characters. There are 18 grids in the machine, which means that 1,584 characters are available in six different point sizes. The perforated tape instructs the machine as to which character to place between the light source and the sensitive film. The exposure is made and the process is repeated very rapidly until the spool is completed, after which the exposed film is developed. The product is positive, right reading characters on film or paper. This machine can cope up with the output of three keyboard operators. Once the film has been developed it can be used to prepare both letterpress blocks and litho-plates.

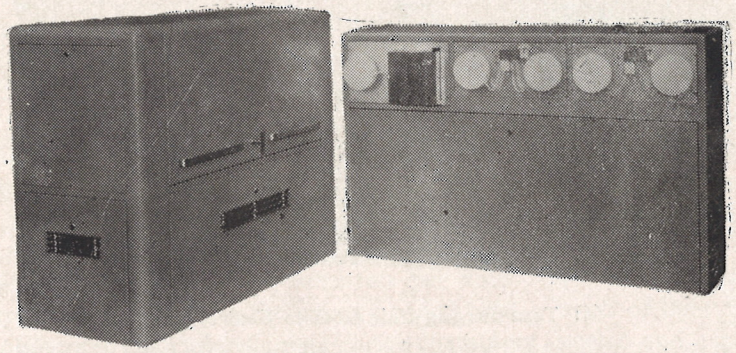
342. The Lino-film Corrector : The film requiring correction is placed in one galley and the film containing corrected lines in the adjacent galley. The point size is set on the dial. The dial is also set for the desired type of correction, line for line, substitution of a complete paragraph or replacing a line by three or four. The machine then automatically removes the lines not required and prints the corrected ones in place. The correction speed is three lines per minute. It may be noticed that many corrections can be avoided by the line-erase device on the keyboard. Composer performs two functions, one of make-up and the other of enlarging. This produces film or paper positive 3 to 108 pt. size and 96 ems measure. It photographs the galley, line by line, altering its position to conform to a layout and if necessary by enlarging or reducing its size within certain limits.

The Photon or The Lumitype

343. The Lumitype is known as Photon in America. It is marketed in Great Britain by Messrs. Crossfield Electronics Ltd. The keyboard unit produces one inch wide, eight level tape, which records all the



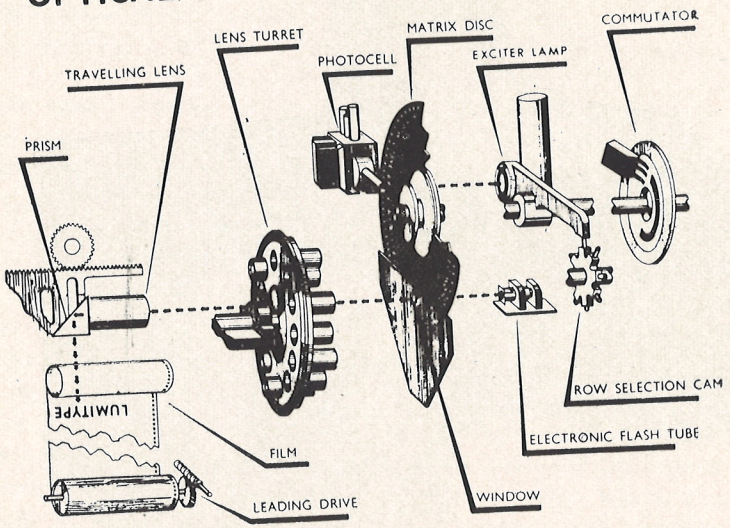
(a) **Lumitype 540 Keyboard**



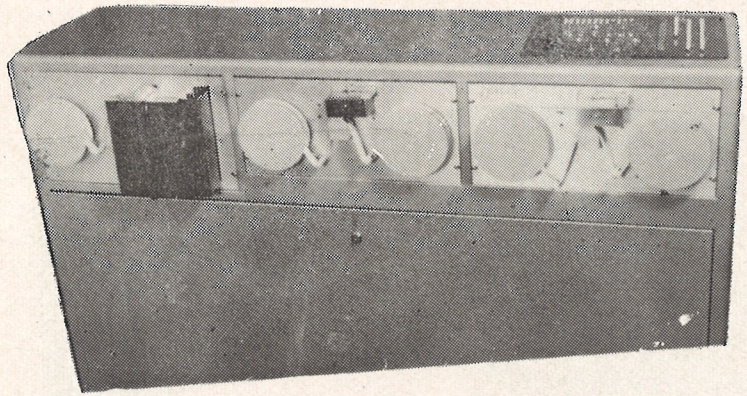
(b) **Lumitype 540 Control-unit and Photo-unit**

PLATE 115

OPTICAL SYSTEM OF THE LUMITYPE



(c) Optical system of the Lumitype



(d) Tape merging Unit fitted to Control Unit

PLATE 116

information necessary for the photographic unit. The first row of each group of three designates the character itself. The second row relates to the width or set and the third can be used for any other function. An extra hole, provided above the third row, is used for synchronization.

344. The Lumitype installation comprises of a Tape perforating keyboard, a Photographic Unit and a Control Unit with a tape-reader. The keyboard unit is composed of a new IBM input-output electric typewriter of golf-ball type, with push buttons on both sides of the typewriter, counters, various controls and indicators. The Style-selecter keyboard permits mixing of type faces and sizes, even in the same line. On the 540 Lumitype, sixteen type faces can be selected in any of the twelve different point sizes from 5 points to 72 points. More than 40 different point-sets are available to push button control. This special feature of the keyboard facilitates close-ups and open-ups of the set-up matter. Line lengths are possible from zero to 7″ by increment of 1/100″. This can be increased to 9″ by special arrangements. Facilities for multiple justification, cancellation of a line set, additional leading, automatic insertion of leaders, letter-spacing, are all available on the keyboard. The provision of the zero-set enables the operator to superimpose a character. This device would be particularly suitable for the Devanagari setting, when certain elements are superimposed with the other characters, on the same set-width. A Stop-code punched, causes the photographic unit to stop, giving a signal to the attendant who can then perform necessary change. The operation can vary the set of the space-band at will. When the tape is fed the functions are read by the calculation unit first and the character information is read next. The end of the line is presented to the reading unit first. The code of line-length and deficit is read and necessary calculations are made for justification.

345. The Lumitype Photographic Unit is provided with a matrix disc, which is a glass plate 8 inches in diameter, containing 16 complete founts of 90 character alphabets in the negative form. The disc is pivoted at its exact centre. These 16 type-sets combined with 12 lenses, held in a turret, enable setting of a minimum of 192 type founts from one single disc. The disc rotates continuously at a speed of ten revolutions per second, giving 30,000 characters per hour. While the character information is read from the moving coded tape, a beam of light from a stroboscopic flash tube illuminates the characters selected and exposes their images through appropriate bases into the photographic film or paper. The strobe-flash of four micro-seconds duration, optically stops the disc during the exposure. A second travelling lens in the optical

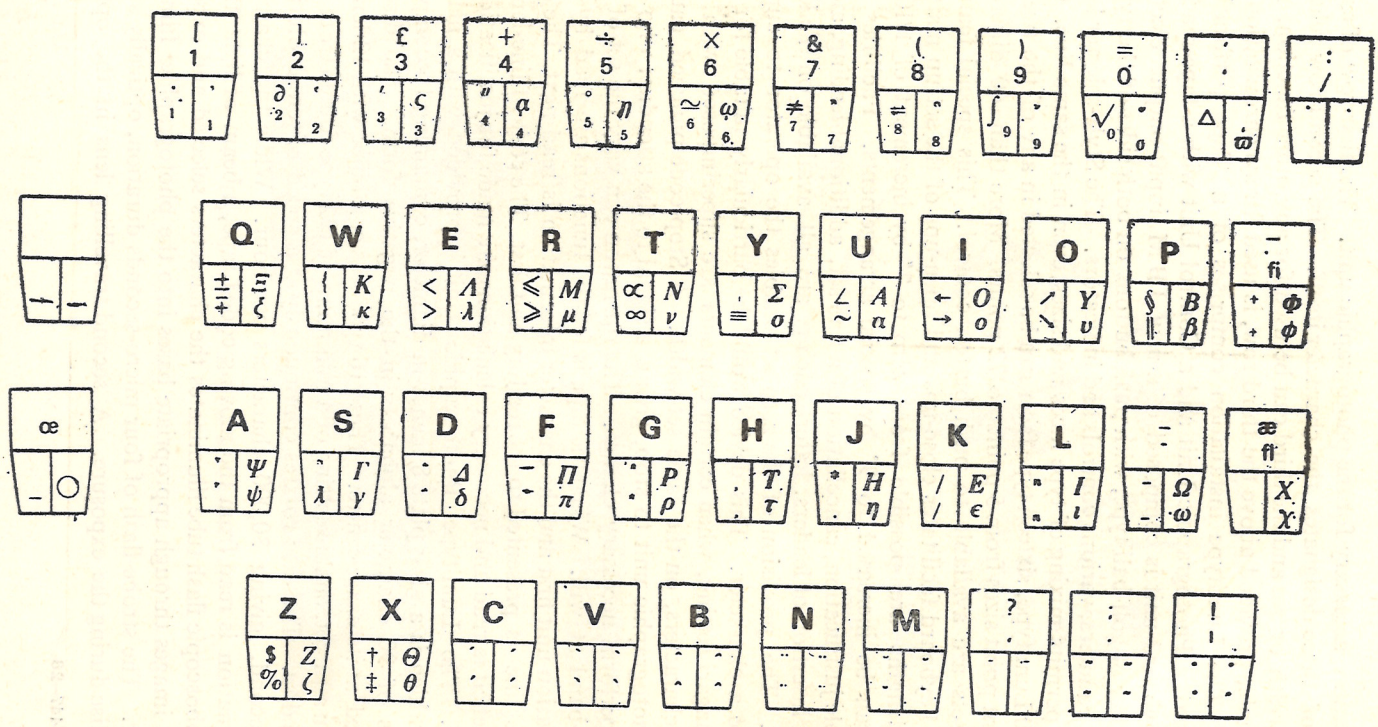
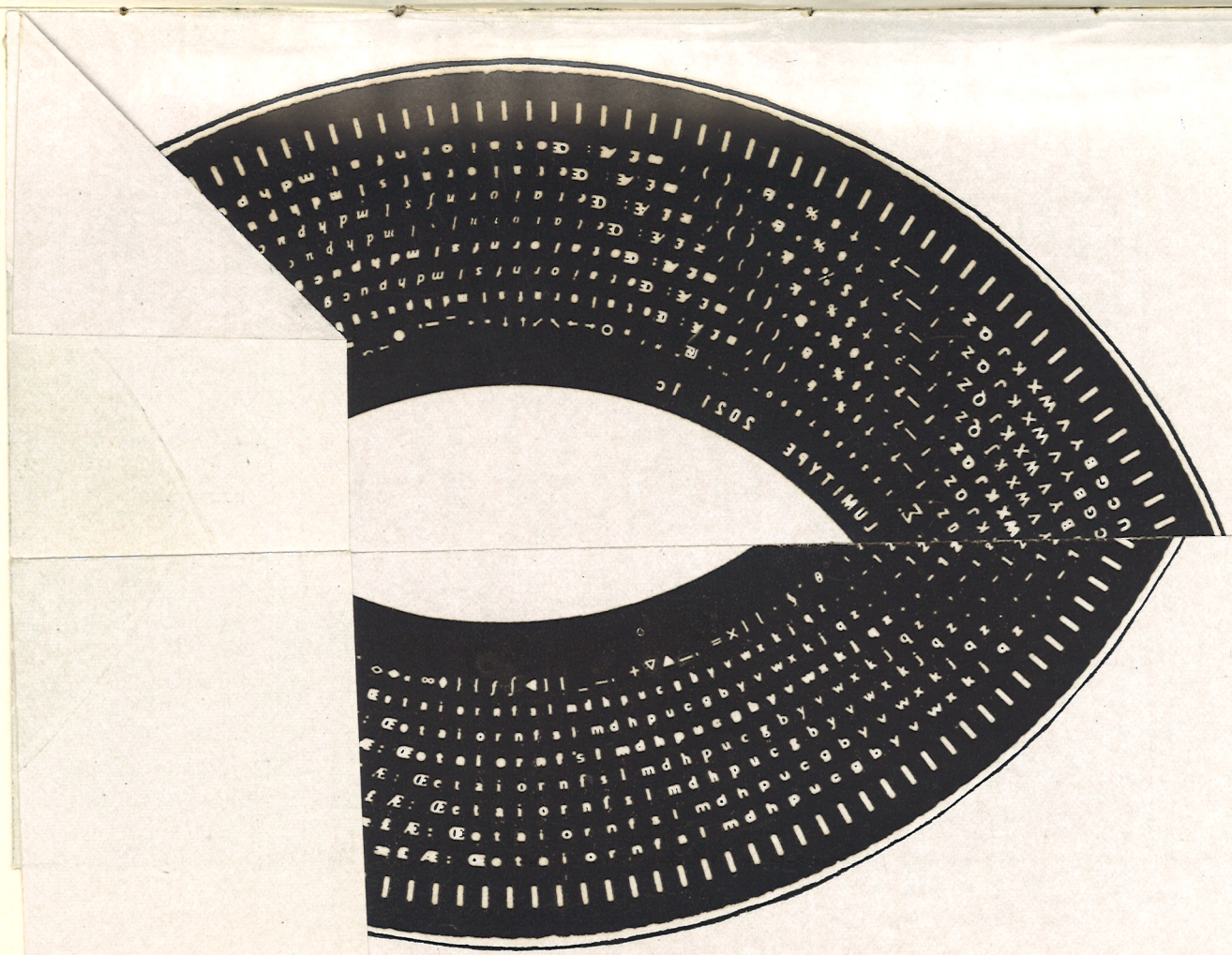
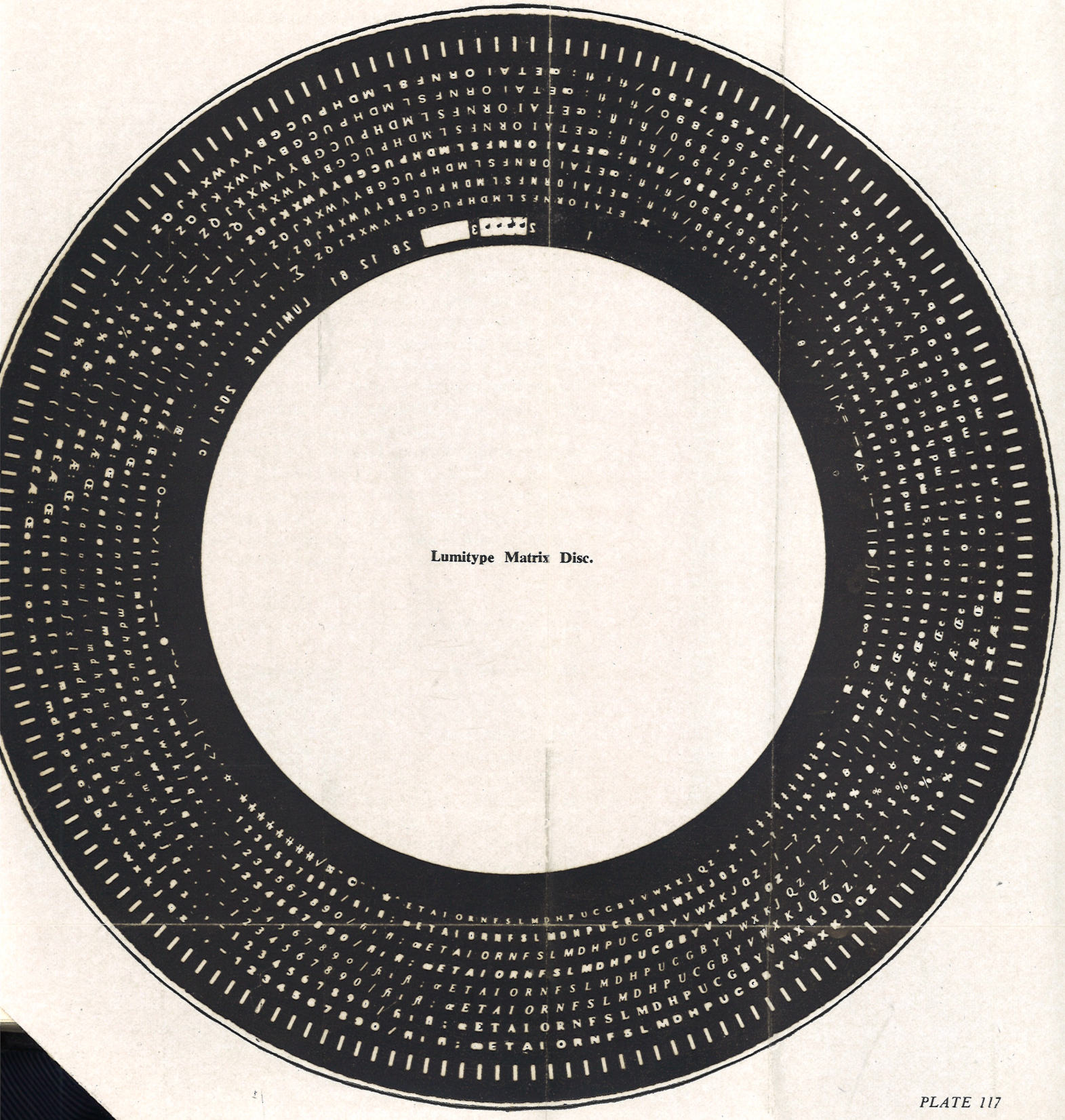


Fig. 127. **Lumitype Keyboard**





Lumitype Matrix Disc.

system moves with its axis parallel to the surface of the film and in conjunction with a right angle prism, produces the desired letter and necessary word spacing. The film or paper remains stationary as a line is set. The photographic unit houses an electro-mechanical justification check circuit. It gives a signal for wrong justification or when the calculation circuit commits an error.

346. The corrections in Lumitype setting can be done either by 'killing' the line or by changing characters within the line. When an error is noticed on the type-script proof, the operator touches a key which removes the code information for each character to be deleted. A Tape Merging Device is provided to enable the production of a perfected film. The correction-tape is separately keyboarded and is merged with the main tape, wherever a correction is required, by erasing the incorrect line. The correction-tape also carries code for follow-ons running headlines, other alterations in style, placings, etc. Merging of the make-up tape with the main tape, produces made-up pages automatically. Kerning and special fillings of characters are accomplished and set-width is changed. The Pi-Mat attachment provides the characters and symbols, not on the matrix disc. Floating accents are provided. The end product of the Lumitype Photo Unit is a wrong reading (Model 200) or right reading (Model 540) film positive, suitable for direct production of offset and photo-gravure. From the positive contact negative is made for letterpress plates. Paper positive can also be produced for art-work. The photo-setting technique cannot therefore be by-passed while considering the problems of script.

Linasec Computer

347. About forty per cent of the time of the perforator-operator is spent in watching the justification functions, making proper line, etc. These extra functions limit the speed of perforating. The Linotype Company has developed a computor perforator known as *Linasec*. It is a semi automatic electronic computor specially built for producing the justified tapes for the fast line-

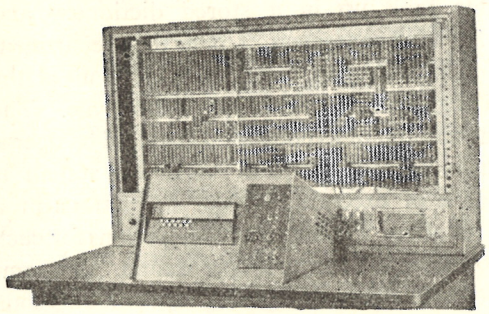


Fig. 128. Linasec

casting machines. A running tape perforated on a simple typewriter is placed into the input-reader of the Linasec. The Linasec is set to the desired length and a width plug inserted to impose the matrix-width values of the type-face to be used. The Linasec when switched on, reads the simple input-tape and begins to perforate a new tape at the rate of 5,000 to 6,000 newspaper lines an hour. Lines which end with the complete words are automatically perforated into the output-tape. When hyphenation is required, the entire word is displayed on cathode ray tubes together with an indication of the last character which can be accommodated. The monitor then decides on the breaking of word by depressing one of the eleven buttons for hyphenation or selects the preceding inter-word space. Along with the hyphenation the speed of the Linasec is about 1½ news paper lines of 12 ems per second, i.e. about 3,00,000 ens per hour.

348. The work of the monitor in hyphenation can be eliminated by using a general purpose intermediate-range computor, in which is stored a dictionary to take over the functions of the Linasec. Such a computor can consume input-tape at the rate of about 100 characters per second. The computor techniques were first applied to printing by the French team of Bafour, Bernard and Raymond who patented in 1953-54 a system for controlling Slug casters, Monotype casters and Photo-composing machines. The system involves feeding the computor with words, figures and symbols, programming the computor to carry out editorial and typographical instructions, and translating the results into a form suitable for operating composing machines. The word-splitting computor-programme demonstrated in the U.K. was developed in 1962 by P. K. Mitra of the Indian Statistical Institute working with Ferranti Ltd. At the Perry Publications Inc., West Palan Beach, Florida, a programme is used wherein hyphenation is effected by (1) recognising key prefixes and suffixes, (2) table look up in a stored dictionary and (3) arbitrary division after 3, 5, 7 or 9 characters. Under the Department of Scientific and Industrial Research Project, research is taken up at the Physics Department at the King's College, Newcastle-upon Tyne. The work is aimed at minimising the amount of hyphenation required by operating on several lines of type at once. The Ferranti Argus 104 system is built around a computor capalble of executing 14,000 instructions in a second. The programme invoves about 70 computor-instructions for each character composed. Thus 200 characters can be set per second. The computor-processed T.T.S., Monotype or Photo-composing tape contains code numbers indicating the chosen types and sizes. The product of one such computor would be sufficient to operate about 25 composing machines.

CHAPTER XV

MECHANICAL COMPOSING IN DEVANAGARI

349. Since, on the Monotype machine individual types are cast, it is possible to cast a wider face on thinner set-size with an overhang. It is possible to cast sloping italics on the Monotype machine. The overhangs then *sit* on the body of the adjacent type, which is set either before or after. If the word begins with an overhang on the left or ends with an overhang on the right, there would be no other type to support the overhang. In such cases a high-space, i.e. a space of the same shoulder height, is set to support the overhang. Due to the fact that the Monotype machine is constructed to compose the Roman script, which is a linear script, it is not possible to set the three-step Devanagari on it. It is possible to set *akhand* system of the Devanagari on the Monotype without resorting to angular bodies. But owing to the limitations of the Monotype matrix-case, this has not been possible. It may be noted here that the number of characters in the *akhand* system is as high as 600, inclusive of the conjunct letters usually required.

MONOTYPE DEVANAGARI SYSTEM OF DATE

350. The present Monotype Devanagari System was perfected by S. R. Date. In the Monotype system, the principle of *akhand* types with overhangs was adopted as a basis, in preference to the three-step composition. The principle was, however, extended to all letters and practically every alternate letter is constructed by combination of the letters with overhanging *velānti*, *mātrā* and *ukār* characters on high-space. The Monotype system works with 255 matrices* out of which four are spaces, one high-space, 88 letters with overhangs, 17 letters on extended body, 107 full body letters, 33 *mātrā* signs and a few special letters. The letters with overhangs are required to be combined with *velāntis*, *mātrās* and *ukārs*, on either sides, at the top or at the bottom. These overhanging letters are cast on body, less by 5 units in set-width. When the overhanging letters are not to be combined with any vowel-signs at the top or bottom, the body space under the overhang is filled in with high-space. The system is explained graphically in earlier chapter.

* The capacity is now increased to and the Russian Monotype provides matrics.

Table 61.

MONOTYPE

LIST OF THE CHARACTERS AVAILABLE ON THE AND SUPERIOR FIGURES AND FRACTIONS

Letters on full body

Full & half letters	*Ukāri*	*Mātrā letters*
[अ 13/195* आ 3/312] ई 10/196 उ 2/197		
क 13/176 ग 11/177 ङ 12/263 ङ॰ 13/269*		के 13/198* कें 13/199*
क्‌ 9/61 [ख 9/479 ख़ 9/492] ग़ 6/63 ङ्‌ 12/65		
ढ 8/64 ढ़ 9/248* ॻ /249* ॾ 6/250		
च 13/178 ज 13/179 ञ 7/309*		चे 13/200 चें 13/201*
ट्‌ 9/66 ड्‌ 9/67 ढ्‌ 9/68 ण्‌ 12/69 त्‌ 9/251*		
ट 10/180 ड 11/181 ण 13/223 ऩ 7/70		णें 13/202*
त 11/182 द 10/183 ध 12/485* न 11/184	तु 11/95 तू 11/96	ते 11/203* दे 10/205 ने 11/429*
त्‌ 6/71 द्‌ 8/74 ध्‌ 8/482 न्‌ 6/76	दु 10/97 दू 10/98	तें 11/204* नें 11/206*
प 10/185 ब 11/186 भ 13/491* म 12/187	पु 10/99 पू 10/100	पे 10/207 भे 12/454* मे 12/208
ट्‌ 6/77 प्‌ 9/78 ब्‌ 7/79 भ्‌ 9/486 म्‌ 8/81 फ़्‌ 9/252*		पें 11/442* में 12/436* मैं 12/438*
य 11/188 र 10/189 [ल 13/313 ळ /190] व 11/191		रे 10/209 वे 11/213* [लें 13/324* ळें /211*]
[श 13/369 ष /192] स 12/193 ह 10/194	सु 12/104 सू 12/105	से 12/215 है 10/325
ऱ 7/82 ः 6/83* ऴ 8/84 ं 7/85 [ऱ 8/376 ऴ /86]		वें 11/214* [लें 13/326* ळें /212 *]
ऽ 7/87 ऋ 8/88 ॠ 9/90	हूं 10/421*	सें 12/216* हें 11/218* हैं 10/449*

Note.—The first figure under the character indicates the unit value while the second figure indicates the matrix number. The 'star' after the letter indicates overhang, while the star before the letter indicates extended body on which the overhang of the preceding letter rests. The star after the matrix number indicates outside-characters.

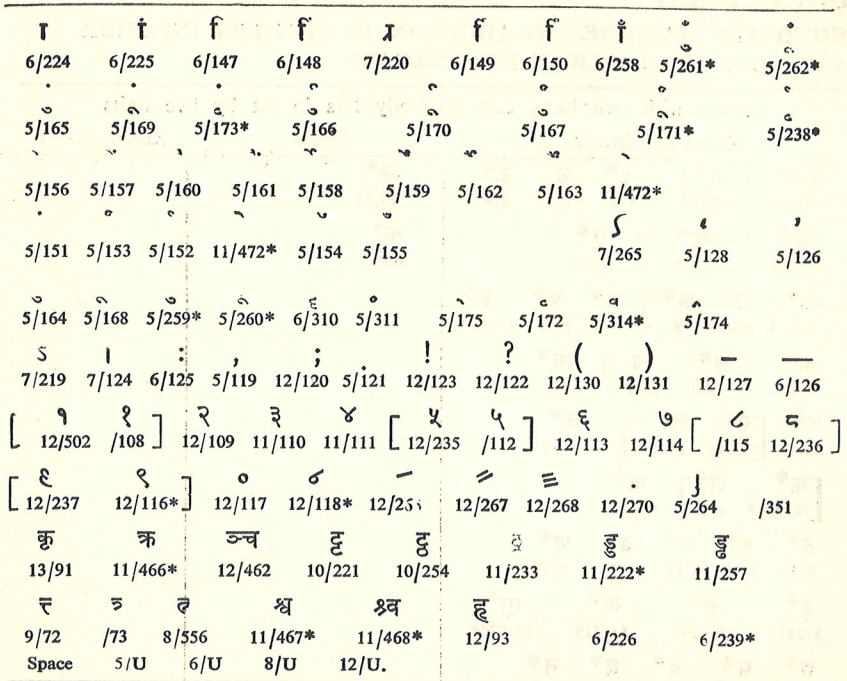
DEVANAGARI

MONOTYPE MACHINE. IN ADDITION TO THIS LIST INFERIOR ARE ALSO AVAILABLE IN DEVANAGARI

Letters with over-hang cast on body less in set by five units

Full & half letters	*Ukāri*	*Mātrā letters*
[अ* 8/1* आ* 8/227] इ* 5/2 उ 7/3 ऊ* 8/4	ॐ* 12/53	
ऋ* 13/255 ॠ* 13/5 ए* 6/6	कु* 8/94	
क* 8/7 [ख* 9/473 ख़* /8] ग* 6/9 घ* 7/10 ङ* 7/308*		
क़* 8/240 [ख़* 9/480 ख़ /241] ग़* 6/42		
च* 8/11 [छ* 8/501 छ* 8/12*] ज* 8/13		
[झ* 10/231* झ* 8/14] ज़* 8/243		
ट* 5/15 ठ* 5/16 ड* 6/17 ढ* 5/18 ण* 8/19		
ढ़* 5/247 ड़* 6/229 ग़* 11/315 ए* 10/230*		
त* 6/20 थ* 7/21 द* 5/22 ध* 7/474 न* 6/24		
प* 5/25 फ* 8/26 ब* 6/27 भ* 8/475	फु* 8/101	
म* 7/29 फ़* 8/244		
य* 6/30 र* 5/31 [ल* 8/232 ळ* /32] व* 9/33	रु* 5/102 रू* 8 103	
[श* 8/503 ष* /34] स* 6/35 ह* 7/36	हु* 5/106 हू* 5/107	
ळ* /38 क्ष* 9/39 ज्ञ* 7/40		
ह्‌* 6/89 च* 8/41		

Vowel-signs, Figures and Conjuncts



351. Monotype Devnagari design in 12 pt. (9 set) is based on Nirnaya-sagar Pica No. 1 and is not much distinguishable to a common reader. The larger versions 14 pt. and 16pt. are the enlargements of 12 pt. design and have no relation to the original Nirnayasagar design of 14 pt. Great face. In all the three cases the Monotype face is wider as compared to the height of the letters. Following deficiencies are inherent in the Monotype Devanagari currently in use :

(1) The *Velānti* ि ी and *Velānti-rāfār* ि ी overhang. They do not meet the vertibar of the letter i.e. (मार्मिक).

(2) The *Ukārs* cast on high-speces do not fit properly, distorting the look of the letter (कुणबी).

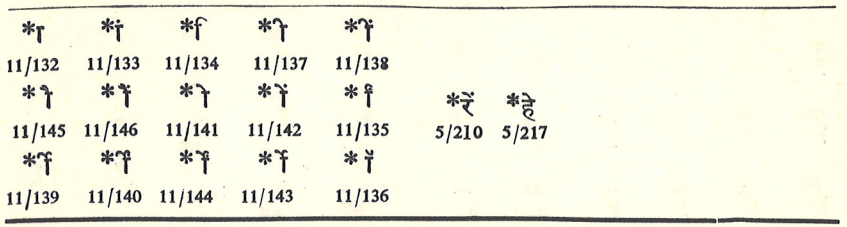
(3) The *Mātrās* and *Ukārs* do not touch the headline and the Vertibar (मेंबर, नूतन).

(4) The double *mātrās* are too small (मैंने).

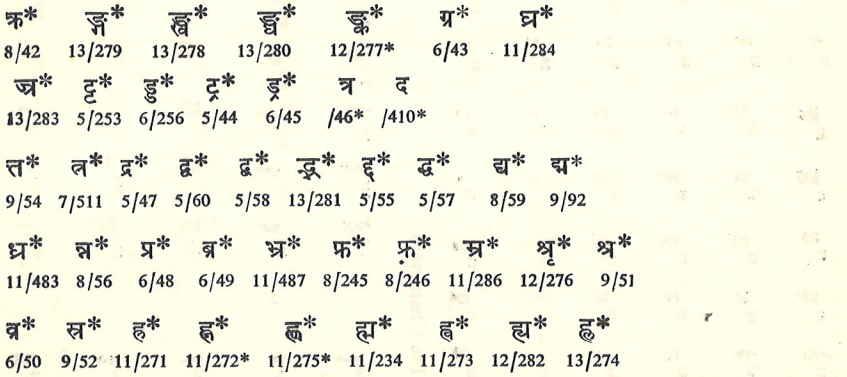
(5) Letter ह्‌ is disproportionate in height.

(6) Letter ॠ, and conjuncts of ह्‌, ङ, द are disproportionate. घ, भ्र, म्र are wide in set. Letters like ख are not available.

Letters with extended body



Conjuncts



(7) The *Mātrās* and *Ukārs* cast on high space are fragile and break while printing.

The above defficiencies are due to the peculiar method of setting over hanging letters, which also makes hand correction rather difficult. These defects can however be removed by adopting linear method of setting the full body letters.

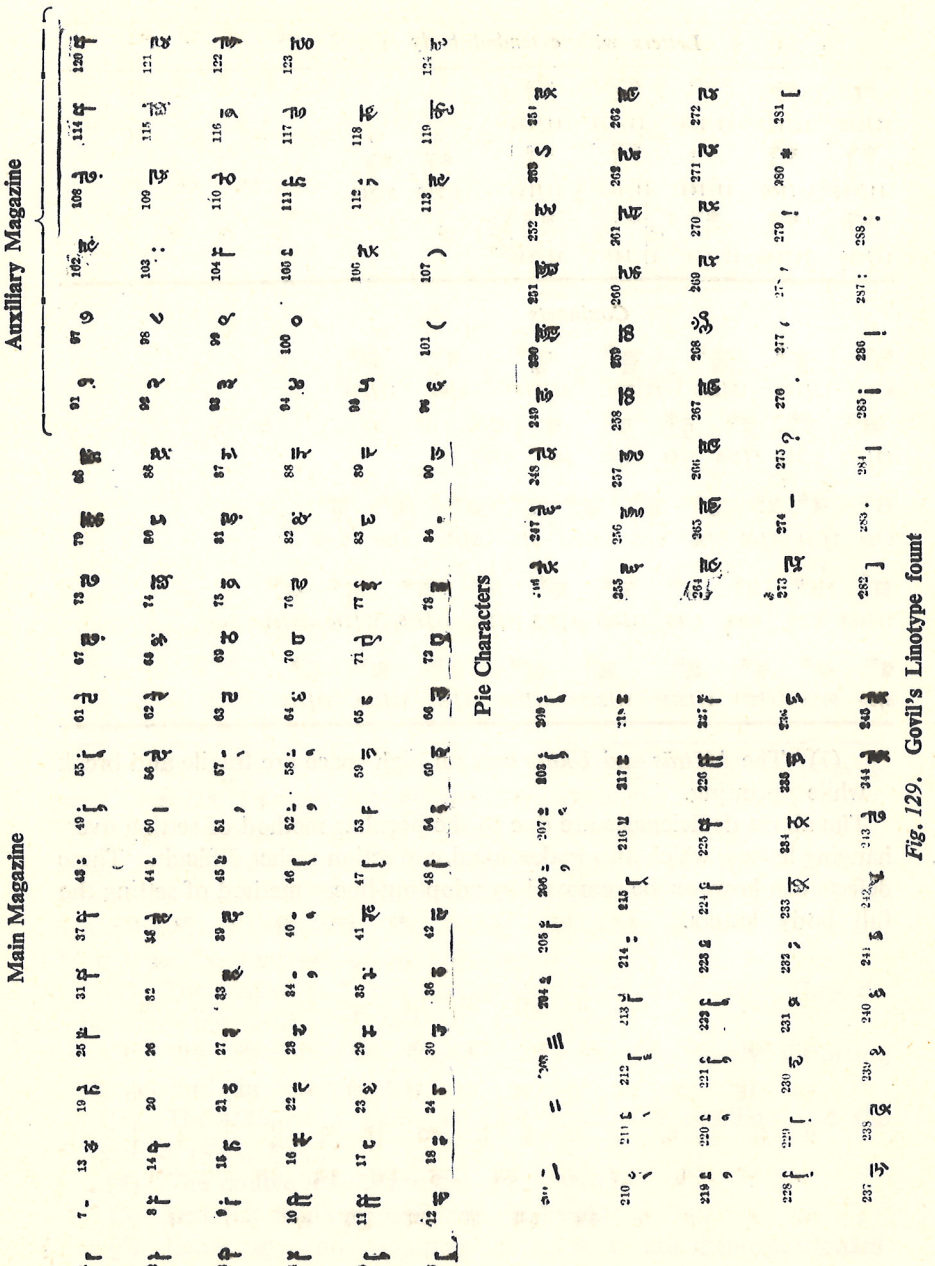


Fig. 129. Govil's Linotype fount

अ आ इ ई उ ऊ ऋ ॠ ऌ ॡ ए ऐ ओ औ अं अः

ा ि ी ु ू ृ ॄ ॢ ॣ े ै ो ौ ं ः

क का कि की कु कू कृ के कै को कौ कं कः

ख खा खि खी खु खू खृ खे खै खो खौ खं खः

च चा चि ची चु चू चृ चे चै चो चौ चं चः

ट टा टि टी टु टू टे टै टो टौ टं टः

त ता ति ती तु तू तृ ते तै तो तौ तं तः

र रा रि री रु रू रे रै रो रौ रं रः

ह हा हि ही हु हू हृ हे है हो हौ हं हः

ह्अ ह्आ ह्इ ह्ई ह्उ ह्ऊ ह्ऋ ह्ए ह्ऐ ह्ओ ह्औ

मं मां मिं मीं मुं मूं मृं में मैं मों मौं

र्दं र्दां र्दिं र्दीं र्दुं र्दूं र्दें र्दैं र्दों र्दौं

Fig. 130. **Setting of *Barakhadi* on the Linotype machine**

क्क क्रव क्य क्र क्र क्त क्व क्ल ख्य ग्ग ग्घ ग्न

ग्य ग्र ग्ल ग्व ग्म ग्ब घ्न घ्य घ्र ङ्क ङ्ख ङ्ग ङ्घ

च्च च्छ च्य च्र ज्ञा ज्झ ज्व ज्र ज्म ज्ज ज्छ ज्झ

ट्ट ट्ठ ट्ठ ट्व ट्ट ट्य ट्र ठ्य ड्र ड्ड ड्ढ ड्र ड्र ड्य ढ्य

ण्ट ण्ठ ण्ड ण्ढ ण्ण ण्य त्त त्न त्म त्य त्र त्व त्थ

थ्य थ्र द्ध द्द द्ध द्म द्ब द्म द्य द्र द्य द्व द्ध ध्य

न्त न्थ न्द न्ध न्न न्म न्य न्व न्ह प्प प्त प्न प्य

प्र प्ल ब्ब ब्द ब्ध ब्भ भ्य म्म म्प म्फ म्ब म्भ म्व

म्ल म्ह ल्ल ल्व ल्ब व्व व्य व्र श्च श्व श्य ष्ट ष्ठ

ह्म ह्न ह्म ह्ल ह्ल ह्य ह्र ह्व ह्य कृ गृ घृ तृ धृ नृ

ष्ण ष्य स्क स्त्र स्त स्न स्फ स्य स्व श्क श्ट श्र

श्च शृ स्त्र क्ष क्ष्म क्ष्य ज्ञ त्र्य द्र्य छ्य ध्य न्य

Fig. 131. **Conjuncts set up on Govil's Linotype Devanagari**

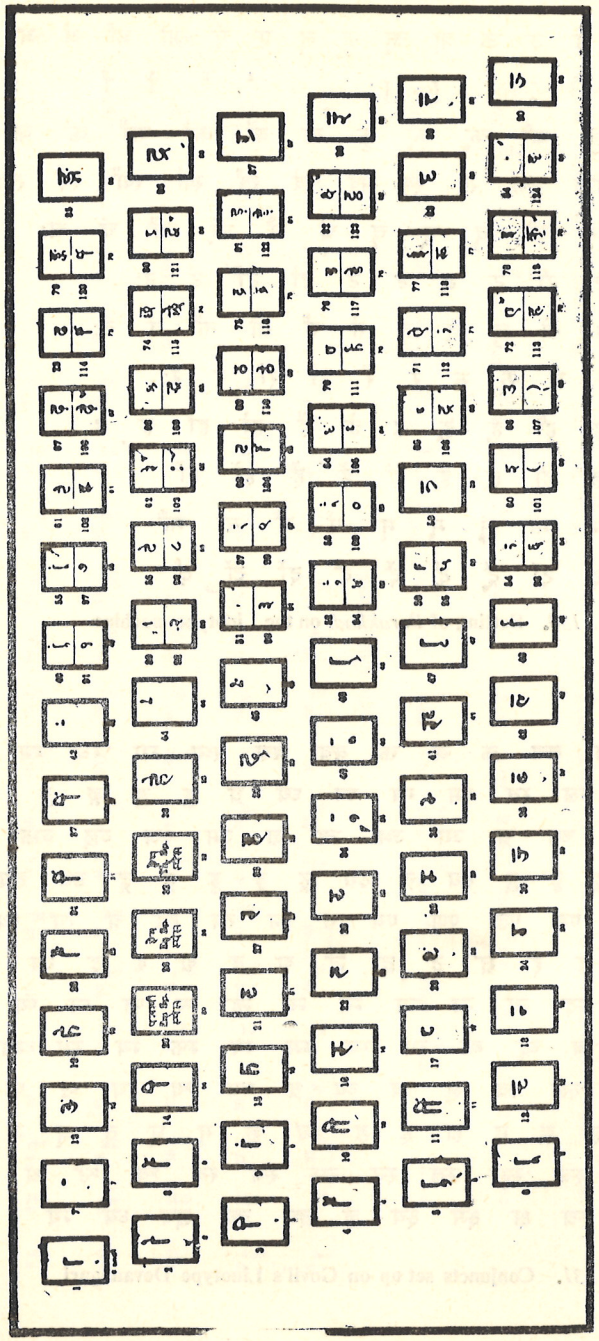


Fig. 132. Keyboard arrangement of Govil's Devanagari Linotype

Where two different characters are shown on the same key in this diagram, the upper matrix runs in the main magazine, and the lower in the auxiliary magazine. Both are controlled by the same key.

Development of Linotype Devanagari

352. Hari G. Govil, a graduate of the Banaras University, is the inventor of Linotype Devanagari. He went to America in 1920 and completed his further education at the Columbia and New York Universities. Govil established an institution in America for Indian Culture, Arts and Philosophy, where he met Mr. Griffith of the Linotype & Machinery Co. and later succeeded in adapting the Devanagari script to the Linotype machines. In this work he had consulted Prof. Brown and Prof. Bender, both Sanskrit scholars. Govil's work was based on the work of the late Lokmanya Tilak, who had suggested the split up of the Devanagari letters in suitable linear elements for liner composition.

Govil's Linotype Devanagari

353. Govil's system consists of 90 matrices in the main magazine and 34 matrices in the auxiliary magazine. Some mechanical arrangement was made to release matrices from the auxiliary magazine, by touching 34 keys of the main keyboard representing 34 channels on the main magazine and equal number of channels on the auxiliary magazine. In addition to these 124 matrices, 88 hand-sorts were provided as pie-characters which are kept in a tray from where they could be picked up and inserted.* The characters were cut, two on each matrix, one in light face and the other in heavy face. Later the auxiliary magazine was converted into a side-magazine with a side keyboard, also of 34 keys. However, as the side-magazine machine is much more expensive, a plain machine is made use of, and 34 matrices which were provided in the side-magazine are also added to the sorts tray.

354. Since in the Linotype system of composition, the individual matrices are first assembled in a line before casting the slug, each character has to stand apart and no overhanging of characters is possible. The designer of the Devanagari script on Linotype machines, therefore, conceived the vowel signs of *mātrās* and *ukārs* such as ◌ॅ ◌ॆ ◌ॊ and ◌ु ◌ू going on the top and at the bottom respectively, in vertical position, thus seriously affecting the existing *look* of the script. The vowels, vowel-sigins and *Bārākhadi* of some consonants are reproduced in *Fig.* 130, page 399, to illustrate the limitations of this system.

* *See Fig.* 132 opposit a page, Keyboard, as designed by Govil,

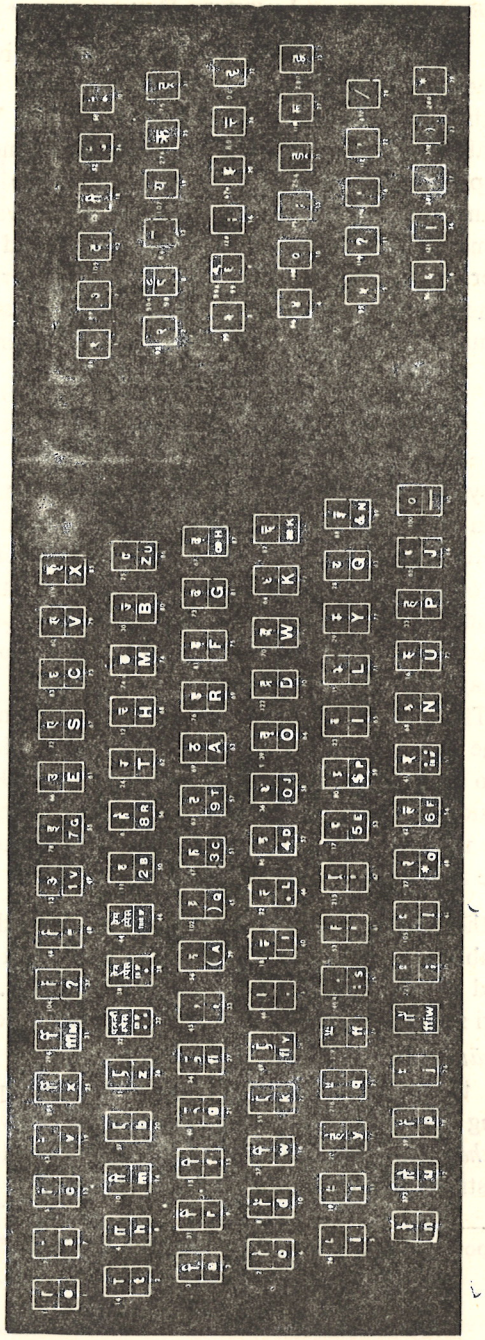


Fig. 133. Linotype revised Devanagari and English No. 12, Keyboard and Sorts Case 1952

355. The method of setting the letters in the Linotype system as designed by Shri Govil is shown below :

Table 62. **System of setting Devanagari on the Linotype machine**

अ	13 अ 1	न	16 न 1	को	21 ा 15 क 7 - 2	हों	33 ह 7 - 8 ॅ
आ	13 अ 1 ा 1	प	17 प 1	कों	21 ा 15 क 7 - 4 ॅ	हौं	33 ह 7 - 25 ॅ
इ	78 इ 7 -	फ	17 प 15 फ	कं	21 ा 15 क 43 :	क़	288 : 21 ा 15 क
ई	77 ई 7 -	ब	36 ब 1 ा	क:	21 ा 15 क 103 :	ख़	41 ख 229 ़
उ	66 उ 7 -	भ	35 भ 1 ा	ता	22 त 1 ा 1 ा	ख़ु	288 : 41 ख 5 ु
ऊ	66 उ 54 ू	म	29 म 1 ा	ति	3 ि 22 त 1 ा	ग़	39 ग 220 ़
ऋ	59 ऋ 53 ि 47 ृ	य	28 य 1 ा	ती	22 त 10 ी	ज़	30 ज 221 ़
ॠ	59 ऋ 53 ि 212 ॄ	र	27 र 7 -	तु	22 त 5 ु	ड़	22 ड 228 ़
ऌ	42 ल 47 ॢ	ल	42 ल 1 ा	तू	22 त 6 ू	पॉ	17 प 1 213 ॅ
ॡ	42 ल 212 ॣ	व	21 ठ 1 ा	ते	22 त 2 े	दॅ	56 द 105 ॅ
ए	72 ए 7 -	श	60 श 1 ा	तै	22 त 4 ै	दॉ	39 द 7 - 104 ॅ
ऐ	71 ऐ 7 -	ष	65 ष 1 ा	तो	22 त 1 ा 2 े	गॅ	21 ग 104 ॅ
ओ	13 अ 1 ा 2 े	स	16 स 1 ा	तौ	22 त 1 ा 4 ै	षॉ	65 ष 9 ॅ 101 ॅ
औ	13 अ 1 ा 4 ै	ह	33 ह 7 -	तं	22 त 9 ं	वि	114 ि 21 ठ 1 ा
अं	13 अ 9 ं	क्ष	82 क्ष 1 ा	त:	22 त 1 ा 103 :	र्दी	39 द 120 ी
अ:	13 अ 1 ा 103 :	त्र	59 ञ 1 ा	मां	29 म 1 ा 9 ं	र्ती	22 त 220 ी
क	21 ठ 15 क	ज्ञ	88 ज्ञ 1 ा	मिं	31 ि 29 म 1 ा	एं	72 ए 43 :
ख	41 ख 1 ा	श्र	68 श्र 1 ा	मीं	29 म 11 ी ं	ऐं	71 ऐ 43 :
ग	24 ग 1 ा	मृ	29 म 47 ृ	मुं	29 म 49 ुं	आँ	13 अ 1 ा 205 ॅ
घ	83 घ 1 ा	गृ	24 ग 47 ृ	मूं	29 म 55 ूं	क्र	75 क 15 ्
च	12 च 1 ा	र्ग	24 ग 48 ्	में	29 म 8 ें	भ्र	35 भ 112 ् 1 ा
ज	30 ज 1 ा	र्क	21 ठ 111 ्	मैं	29 म 25 ैं	म्र	29 म 112 ् 1 ा
झ	35 झ 15 ्	र्फ	17 प 111 ्	मों	29 म 1 ा 8 ें	म्र	29 म 215 ्
ञ	90 ञ 1 ा	त्	22 त 40 ्	मौं	29 म 1 ा 25 ैं	व्र	75 व 1 ा
ट	63 ट 7 -	द्	39 द 57 -	हं	33 ह 43 :	स्र	16 स 112 ् 1 ा
ठ	76 ठ 7 -	का	21 ठ 15 क 7 - 1 ा	हां	33 ह 7 - 9 ं	ह्म	113 ह 1 ा
ड	73 ड 7 -	कि	3 ि 21 ठ 15 क	हिं	31 ि 33 ह 7 -	ह्म	113 ह 7 -
ढ	70 ढ 1 ा	की	21 ठ 15 क 14 ी	हीं	33 ह 37 ी ं	द्य	124 द 1 ा
ण	22 त 1 ा	कु	21 ठ 15 क 34 - ु	हुं	33 ह 52 : ु	द्य	124 द 7 -
त	28 थ 1 ा	कू	21 ठ 15 क 40 - ू	हूं	33 ह 58 : ू	ह्य	102 ह 1 ा
थ	39 द 7 -	कें	21 ठ 19 क 7 - ें	हें	38 ह 43 : ें	ह्य	242 द 1 ा
द	64 ध 1 ा	कै	21 ठ 19 क 44 ै	हैं	38 ह 45 : ै	ह्न	78 न 214 ् 1 ा

Table 63 : **COMPARATIVE STATEMENT OF THE MATRICES MACHINE AND THOSE PROVIDED ON 1953**

(i) INTERTYPE MATRICES 1963

(Number 142)

अ	इ	उ	ए	ऋ							
31/85	61/16A	67/77A	73/76	152							
ि	ि	ख	ग	ह	ङ		ल	छ	ज	झ	ञ	झ
44/156	8/154	16/9A	10/10	11/11	148		14/14	76/93	15/15	100	161	177
ट	ठ	ड	ढ	ण			त	थ	द	ध	न	
68/79A	62/95	69/94A	75/96A	17/17			21/20	22/21	74/82A	23/23A	27/24	
प	ब	भ	म				य	र	ल	व	ळ	
20/26	29/28	36/29A	28/30				12/31	160	65/64A	102	18/43	9/12	178
श	ष	स	ह	ह्	ळ	क्ष	ज्ञ		ड़	ढ़	ॠ	
30/18	24/37	59/22	64/73A	149	97	60/103	66/104		57/146A	145A	37/159	
कृ	ग्र	ट्र	त्र	ड्र		द्द	द्र		ड्र	ह्म		
151		53/132A	78/141A	134	42/162		135	70/143A		25/137A	150A	
ट्र	ड्ढ	ह्न										
142A	147A	63/144A										

रु	ृ		कै
77/153	50/157		26/155

ँ	ं	ः	़	ा	ा	ॅ	ॅ	ॅ	े	ै	ॉ	ॉ	ो	ौ
7/7	1/1	54/112	19/19	13/13	71/41	52/105	58/106	98	99	49/59	55/60	39	45	
्	ॅ	े	ें	ै	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ
5/6A	6/163	4/339	170	41/5	47/47	48/164	173	116	107	56/109	46/169	115	166	
ॅ	ॅ	ॅ	ॅ	ॅ										
72/4	2/2A	3/25A	158	125										
ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ				
51/113	45/114	174	127	126	167	168	175	176	171	165				172

१	२	३	४	५	६	७	८	९	०	
79/49	80/50	81/51	82/52	83/53	85/54	86/55	87/56A	88/57	89/58	
,	;	.	!	?	!	:	‘	’		
33/33	36	34/34	40/40	48	42	35/35	120	119		
·	—	–	+	×	′	★	(	)	÷	=
43/46	181	184	183	185	182	188	84/118	90/117	186	187

em sp en sp thin sp
38

Note.--The figures under the characters are the matrix numbers. Where two figures are given the first represents the key-button number and the second the matrix number.

AVAILABLE AT PRESENT ON THE INTERTYPE KEYBOARD OF LINOTYPE

(ii) LINOTYPE MATRICES 1953

(Number 134)

अ	इ	उ	ए	क्ष	ल्						
49/13	55/78	61/66	67/72	276	—						
ि	ि	ख	ग	ह	ङ		ल	छ	ज	झ	ञ
41/53	51/47	79/60	62/24	73/83	67		68/12	74/74	80/30	67/*a*	—
ट	ठ	ड	ढ	ण			त	थ	द	ध	न
57/63	63/69	69/76	81/73	86/25			46/22	58/36	64/39	82/64	40/18
प	ब	भ	म				य	र	ल	व	ळ
53/17	65/23	71/35	77/29				83/28	107	48/27	54/42	50/11
श	ष	स	ह	ळ	क्ष	ज्ञ			ड़	ढ़	ॠ
60/41	84/65	72/16	78/33	87	88/82	88	89/88		75/81	87/67	66/68
कृ	ट्र	ड्र	त्र	ड्र	द्द	द्ध	ह्न	द्र	ह्म		ह्न	ह्ल
85/119	75	254	89	52/86	230	76/70	90	70/122	59/80		45/102	113-90

रू	ृ		कै ह
118	39/54		56/6 17/20

ँ	ं	ः	़	ा	ा	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ
7/7	1/1	19/43	13/5	2/14	8/4	21/40	27/34	52	58	26/51	20/57	28/49	22/55	
ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ
5/26	11/19	4/2	6/9	10/8	18/59	12/373	30/374	23/216	29/309	—	109	47/215		
ॅ	ॅ	ॅ	ॅ	ॅ	ॅ									
14/10	85	3/3	15/15	9/31	16/37									
ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ	ॅ			
42/105	38/223	43/48	25/295	31/294	24/217	37/104		79	85	...	...			

१	२	३	४	५	६	७	८	९	०
91	92	93	94	95	96	97	98	99	90/
,	;	.	|	?	!	:	‘	’	
33/45	120	35/46*a*	34/46	114	121	103	106	112	
–	*	/	(	)					
84	280	370	301	302					

em sp en sp thin sp
44/44 38/38 32/32

Typographical Deficiencies in the Devanagari Slug-composition

356. The defects and deficiencies in the linear Devanagari available on the slug-composing machines are enumerated below :

(1) Separate types for the consonants with slanting top *mātrās* are not available. The *mātrās* in the combinations formed by the *mātrā* matrices placed after the consonants look perpendicular. The *mātrās* are actually printed at right angle to the head-line, instead of, at an acute angle.

(2) The double *mātrās* are cut at obtuse angle to the head-line, i.e., they are inclined towards right.

(3) In case of letters made of consonants with short-bar such as ट ठ ढ and short and long *ukār* (ु and ू) they are placed after the consonants. In this method the next letter is printed at a distance leaving disturbing white space in between two letters such as टुमदार.

(4) छ ठ ढ are cut in conventional style and therefore, the *mātrās* to be joined with them, are placed at a distance छे, ठे, ढे .

(5) It is not possible to construct ऊ and छू.

(6) The vowel mark " ै " is not cut. In case of other *mātrā* signs, there is white space between two letters, i.e. ि क

(7) Letters ळ and ङ are not provided in the fount.

(8) Satisfactory combinations of क and फ are not possible as the vowel-signs fall apart. कु कू कं कॉं

All the defects referred to above are more pronounced in the Intertype. In addition the following defects are noticed in the Intertype* composition :—

(1) The *Mātrā* is *anaemic*.
(2) The belly of letter 'द' is too large.
(3) Short ि sign falls away from the consonant.
(4) The signs of short and long *ukār* (ु ू) are *anaemic*.
(5) The x-portion of 'प्र' is too large.

357. Owing to the distortion in the face of Linotype Devanagari, it is not very popular. Although many Devanagari founts were sold in India, they were hardly made use of. The Government of Bombay purchased two new machines of American height in 1951-52 with Devanagari founts. The then existing Keyboard was revised by the present author in consultation with Prabhakar Padhye, the then Editor of *Nava-shakti*, a popular Marathi Daily, and C. G. Raman, the Manager of Linotype and Machinery Company in Bombay. No further progress could, however, be made till the Printing and Stationery Department, Government of Bombay, commissioned the services of G. P. Vijapure in 1956.

* For comparison please *see* the Table 70 facing page 422

Vijapure Linotype Devanagari

358. Vijapure in his reformed Devanagari, as patented for use in hand-composition and now adapted with considerable modifications, to the Linotype machines, succeeded in eliminating the three-step arrangement and also has done away with the overhanging characters. Vijapure's contribution referred to here is essentially concerned with the angle of the *Mātrā* characters. In addition to this, he has redesigned certain characters such as ट, ठ, etc. by re-positioning the short verti-bar joining the basic character with the head-line, so that when combined with the vowel-signs (*Mātrās*), etc., they are positioned properly, without distorting the original design. In order to adapt the Vijapure type to the Linotype for Devanagari composition, it was necessary to cut new characters with *Mātrās* in the revised design. It was obvious that without the properly designed *Mātrās* in the slanting angle according to the Vijapure scheme, the essential purpose in the reformed Devanagari script as proposed to be adapted to Linotype machine would be lost.

Lucknow Devanagari Linotype Fount

359. The Vijapure type, which has been adapted to Linotype, was originally designed according to the decisions of the Lucknow Conference on the Devanagari script for Hindi composition. This fount was composed of 150 characters as given hereunder :—

Table 64. **Vijapure Linotype fount for Lucknow Hindi**

अ इ ई उ ऋ ॠ ऋं ऌ ए	9
क ख ग घ ङ् च छ ज झ ञ ट ठ ड ढ ण	
त थ द ध न ट प फ ब भ म	
य र ल व श ष स ह ळ क्ष ज्ञ	38
ट्र ड्र ट्र तृ ह्न	5
ऐ ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं ऐं	
पे ब्ं फ्ं मे ऐं रे ऐं वे श्रे ऐं से ऐं ऐं ऐं ऐं ऐं ऐं	34
ऊ पु ॄ पु वॅं यॅं ह्न ऊ ऊं ऊं ऊं	11
ा ि ी ु ू ृ ॅ े ै ॉ ॊ ो ौ ्	
ो ौं ः ँ ी ॅं ॉं	22
ऽ ऽ ऽ ऽ ऽ - - ऽ - ऽ - ऽ ऽ ऽ ऽ ऽ	11
१ २ ३ ४ ५ ६ ७ ८ ९ ०	10
( ) - , ; । ? ! ' :	10
	150

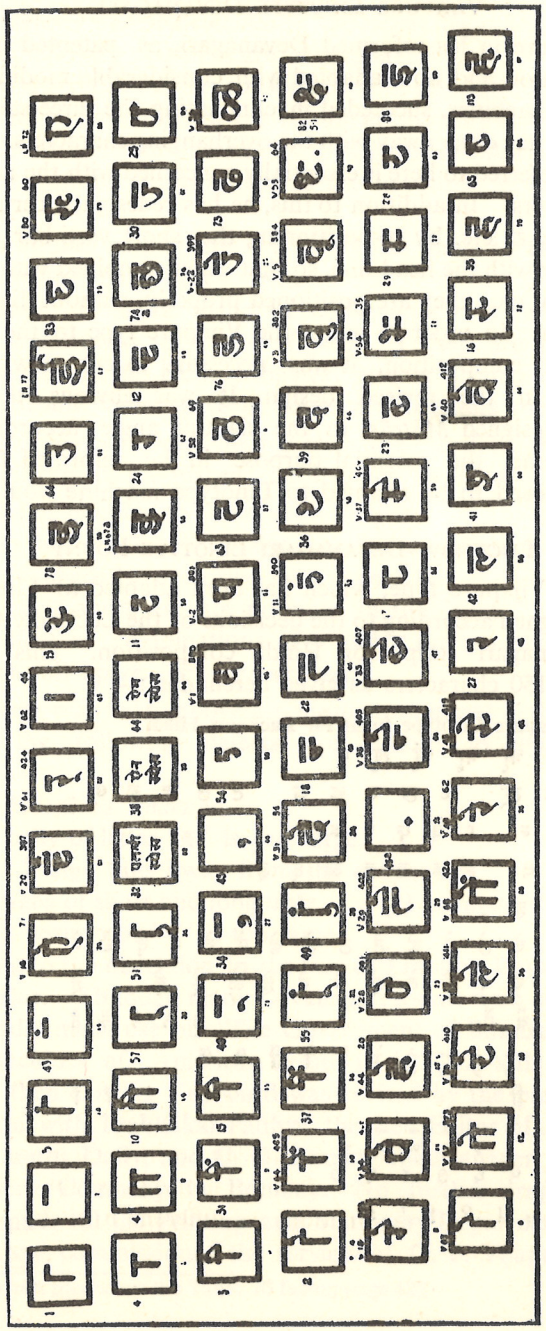


Fig. 134. Linotype Devanagari Keyboard for Devanagari Vijapure System, based on Lucknow Script Reforms
(Prepared for the Government Central Press, Bombay, 1959)

This fount did not provide combinations of the *Rafār* signs representing accented र्. Under the Lucknow scheme such combinations were proposed to be composed as under :

सूर्य for सूर्य ; सर्व for सर्व ; पूर्व for पूर्व

360. The Government of Bombay did not, however, accept the Lucknow reforms for Marathi. It was, therefore, necessary to provide for the *Rafār* (◌) combinations on the side-case. Some of the "R" combination characters, available were transferred to the side-case. In addition to these *Rafāri* matrices available on the Linotype machine, the following 18 characters, representing the accented half र् were to be provided for on the Linotype machines. Vijapure freshly designed these 24 characters inclusive of six new characters at (c) below :

(*a*) क्र्क ग्र्ग द्र्द ब्र्ब म्र्म श्र्श ष्र्ष स्र्स ह्र्ह

(*b*) क्र्क ग्र्ग द्र्द ब्र्ब म्र्म श्र्श ष्र्ष स्र्स ह्र्ह

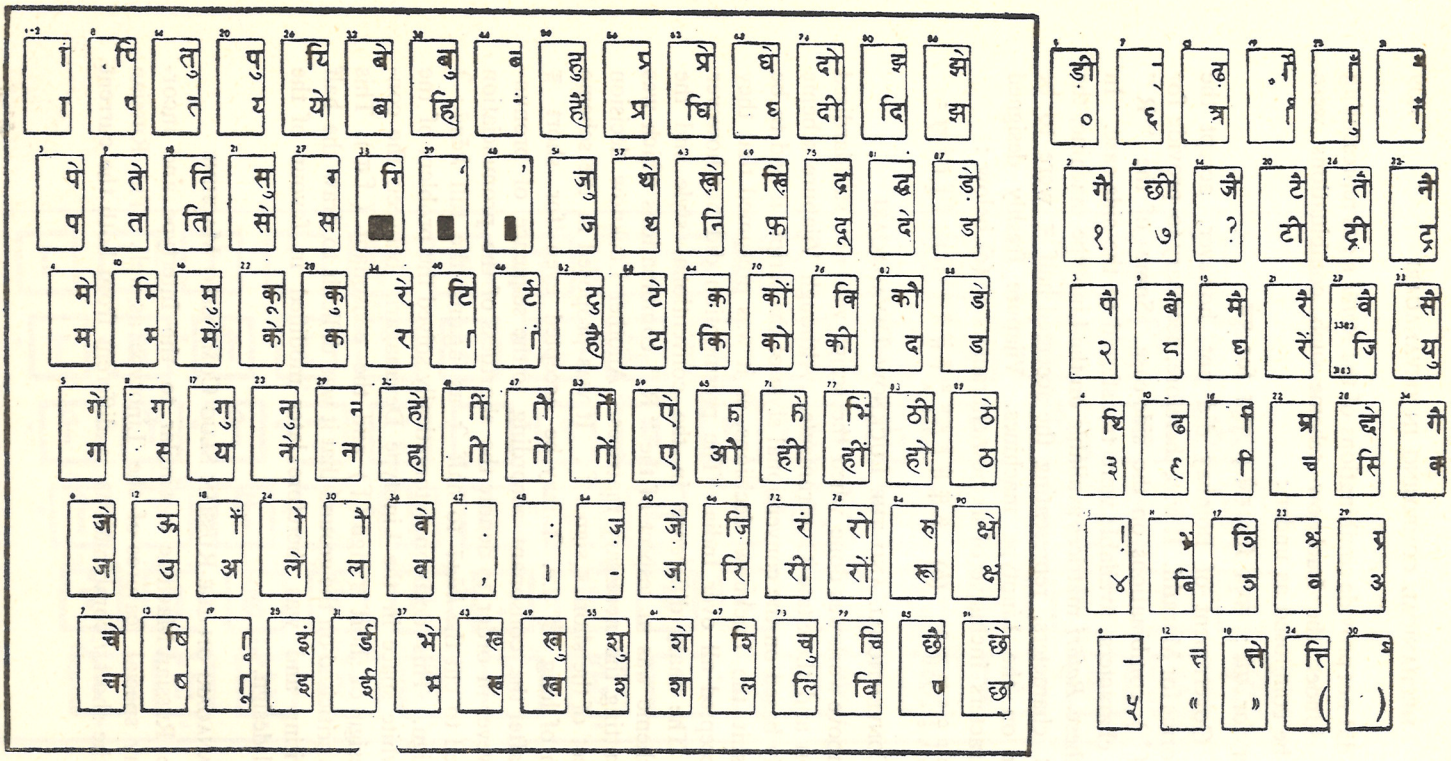
(*c*) क्र्क ग्र्ग द्र्द ब्र्ब म्र्म श्र्श ष्र्ष स्र्स ह्र्ह

Conventional and the Lucknow Devanagari

361. The above work was done when the script was not standardised by the Union and the State Governments. Although Vijapure scheme was originally based on the conventional style of the script, it had to be altered to suit the Lucknow decisions, as it was presumed that they would be accepted all over India. The presumption did not however come true. The main difference in the conventional style and the Lucknow Scheme was in respect of the "R" combinations which was solved by cutting the necessary matrices. Another Lucknow decision was in respect of the short इ sign : f . It was proposed in the scheme that the sign of long ई *i.e.* ी may be accepted even for short इ and placed after the consonant according to the sequence of pronunciation. However in order to denote the shortness of the pronunciation it was decided to cut the *kānā* to half ि as against the full *kānā* : ी of long ई sign. This decision automatically solved the problem of the disturbing white space in the Linotype Devanagari, between the conventional design of short इ sign (f) and the consonant (fग). This decision was criticised on the ground that it was difficult to draw the half *kānā* in writing and was therefore later modified in favour of the conventional design.

Devanagari on the Russian Slug Composing Machine

362. The Russian Machine is similar to the Intertype and incorporates many special features of the Linotype as well. The Russian solution of the short *i* combinations is different from both the current



ः ः ः

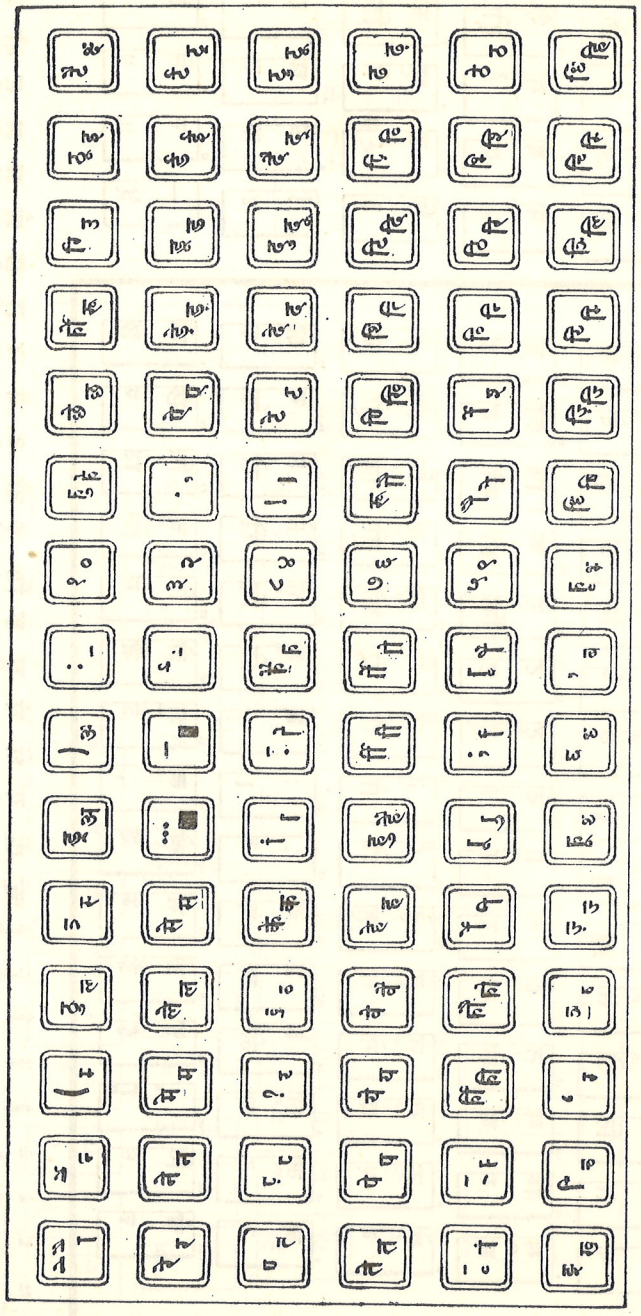


Fig. 135c. Russian Slug Composing Machine, Greek attachment Keyboard layout.

Govil scheme i.e. f ो r as well as the Vijapure scheme f े r. In the Russian scheme the letter is constructed with only two sorts f ि r. This method however increases the number of sorts with matrices like f ि, f ि, f ि etc. without providing the facility of setting slanting *mātrās*, which serves duel purpose (i.e. े r and f े r)

363. The revised Russian Devanagari system was formulated, under the guidance of Mr. F. Sh. Tagirov on the basis of frequency study. Mr. Tagirov published a paper on this scheme in the Monograph 29, issued by the Typographic Research Institute, Moscow. The fount scheme was conceived for model H-8 which is a mixer model with side magazines. The fount contained 248 matrices on the main and side keyboard and 90 hand sorts (see fig. 135a). The alternate Keyboard is shown at Fig. 135b. The same fount was later adapted to Greek attachment (Fig. 135c). In these founts the *Mātrā* and velanti matrices are seperatly provided.

Table 65. **Russian Devanagari fount scheme (Greek attachment)**

	M	U	S
ओ अ इ ई उ ऊ॰ ऋ॰ ए ऐ*	6	1	2
क ख ग घ* ङ॰ च छ ज झ* ञ* ट ठ ड ढ* ण*			
त थ द ध न न प फ ब भ म म			
य र ल ल व श ष स ह ः* ड़ ढ़ ं* ़* ,	37	8	1
ङ॰ ञ॰ ड्र* ट् द् ड॰* ट॰* ऋ* ड्* ढ॰	2	5	3
के* छे* टे* ठे* ते* दे* ने* पे* मे* ये* रे* ले* वे* से* हे*			
है ै॰ ड़े* दै* टै* ठै॰	1	18	2
खि रि* घि* चि* छि॰ जि ड्रि॰ ठि* टि* ठि* णि*			
ति थि* दि धि* नि ब्रि* भि* मि			
यि* रि लि वि शि षि सि हि ज़ि* ऩि॰ ड़ि॰	13	13	4
कु* कू टु* टू ठु* ठू रु* रू ख़ु* ॅ॰ ऊ॰ ऊ॰	3	7	2	
ँ ा ा ि* ी ी ु ू ॅ* ॅ* ॅ* ॅ* ो ो			
ः ः* ॅ ु॰ ू॰ ॅ* ॅ*			
्* ् ि* ी* ॅ॰ ॅ॰ ॅ* ॅ* ़* ॅ॰	14	15	5
F ह ही हे हो ह्रू* ह्रू* हों* है* हु* हीं* हौं* ह॰ ह॰	5	7	2
० २ ४ ६ ९ । , ■ ▌			
१* ३* ८* ७* ५*			
!* .* :* -* ;*)* ‹* '* (* ?* ...* –*	9	17	
	90	91	22

M = Main Magazine; U* = Second position characters; S° = Hand-sorts.

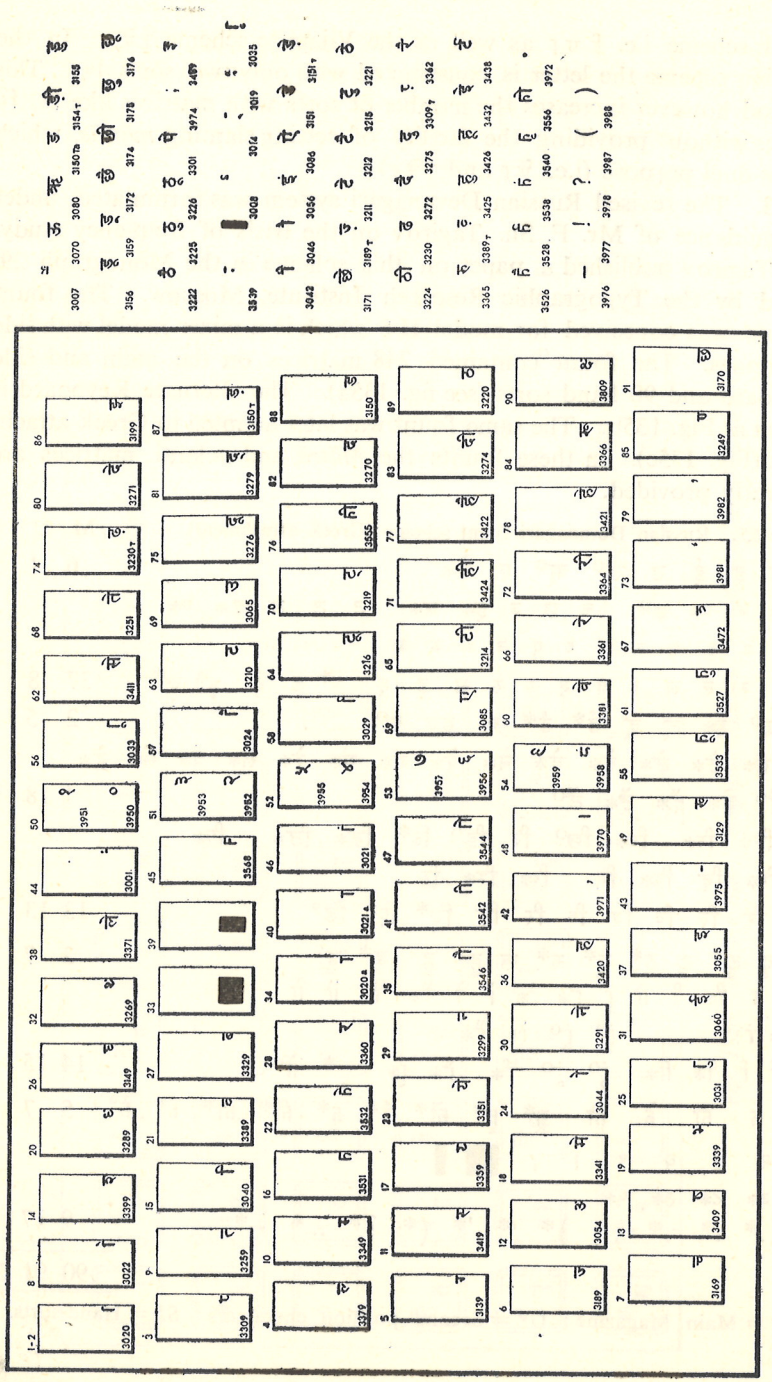


Fig. 136. **Russian Slug Composing Machine, Revised Devanagari Keyboard 906 (1965).**

364. Since the mixer model scheme is elaborate containing large number of sorts the initial investment in the machine is heavy. It was not therefore considered suitable for neswpaper setting. So also was the Greek attachment scheme. A revised fount scheme is therefore worked out on the basis of the Govil-system of constructing short '*i*' combinations. The fount scheme consists of 90 matrices five of which contain double characters. The earlier schemes of Devanagari setting on Russian Slug Composing machines were conceived with a view to meet the typographic requirement of maintaining the existing look of the script.

Table 66. **Revised fount scheme for Russian Slug Composing Machine Layout 906 (1965).**

	M	S
ओ ख़ ग़* ज़ ऊ* ए ऋ* ई*	5	3
क ग घ ङ* च छ ज झ ट ठ ड ढ* ण		
त थ द ध न प ब भ म		
य र ल व श ष स ह क्ष ज्ञ* ड़ ढ़ ऩ* ऱ* ऴ*	31	6
ऺ ॻ ट् ड्* ॿ* ॾ*	3	3
ऐ* छे* जे* ठे* झे* ऽ दे ने पे* मे ऱे*		
ये रे ले वे से हे ऍ* ऎ* ऒ* ऑ* ऐ* औ*	11	13
छी* टी ठी* दी री ही ऴी*	4	3
ॹ* ॺ* ॻ* ॸ* ॾ* ॿ* ॽ* ॾ* ॷ* ॼ* ॾ*	3	10
F क़ ख़ ग़ ज़ ड़ ढ़* फ़* ऩ* ऱ* ऴ*	6	5
ा ि ी ु ू ृ ॅ े ै* ॉ ो ौ ् ॎ ॏ* ॑*		
ः ऀ ँ ऻ* ़	15	5
१ ३ ५ ७ ९ , । - ‘ ’ ▮ ▮	12	
० २ ४ ६ ८	(5)†	
▮* ;* ॕ* ः* .* _* !* ?* (*)*		10
	90	58
	(5)†	

M = Main Magazine ; S* = Side case. † Second position.

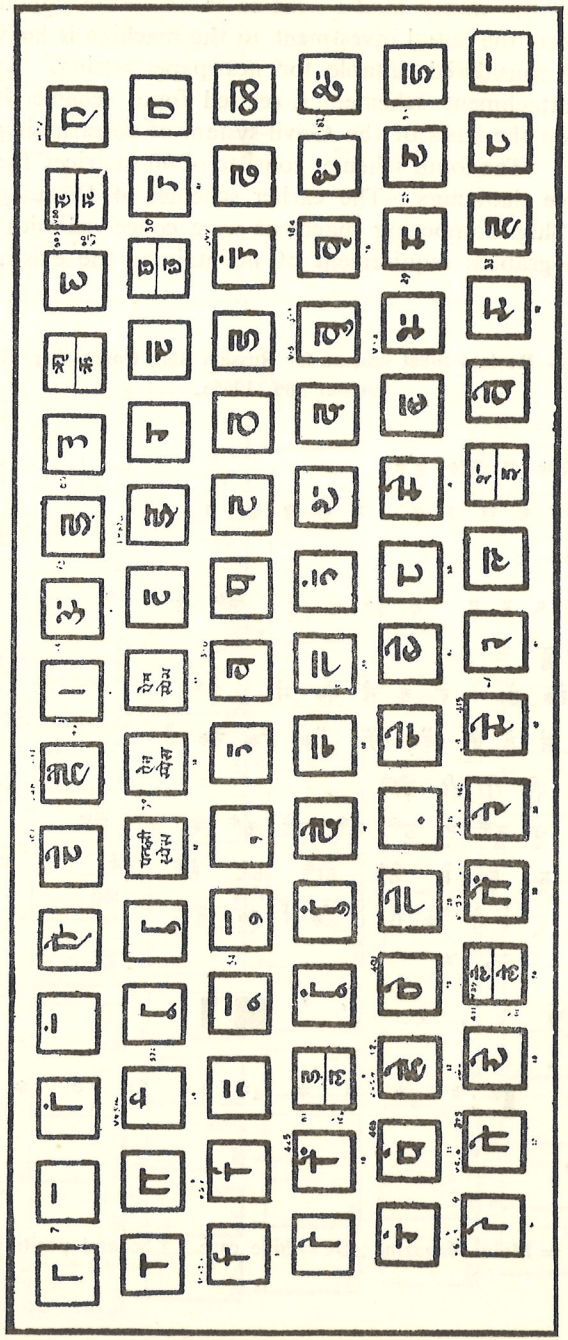


Fig. 137. Provisional Linotype Keyboard for Devanagari, (Hindi and Marathi) 1962 (Vijapure System)

Vijapure Method of Linear Setting of 'shorts *i*-matra'

365. In the Devanagari script available on the Linotype and also in the Devanagari introduced by G. P. Vijapure, the sign ि representing the vowel (short इ) falls a little away from the main consonant. For instance ि क. As the overhanging of the top curve cannot be obtained on slug-casting machine, Vijapure proposed to obtain this short ि sign by using a special character with half the top curve on the *Kānā* ि and join it with the consonant with *mātrā* (ै) as is shown here : ि. Trial characters cut for this purpose were tried and found to be successful. The implementation of this scheme involved re-designing of all the *mātrā* characters in a different angle suitable for joining with the special short इ sign ि, to complete the *Velāntī*. This is a novel typographical solution which will eliminate the disturbing white space between the short इ vowel-sign (ि) and the consonant.

Standardised Method of Conjunct Formations

366. It is well known that the main obstacle to any attempt towards reduction in the number of type sorts in Devanagari fount, is the irregular conjunct formations. The Lucknow reforms had simplified this problem by allowing the use of *halant*. That decision was however not acceptable to many and it was not until 1960, that a firm stand was taken in respect of conjunct formations by the Government of India. The Government of Maharashtra subsequently accepted these decisions of the Government of India with slight change.* One of the important decisions is in regard to the conjunct formation as shown at 2 pp. 356-357 in the accepted alphabet for Devanagari. Several full and half conjuncts can now be removed from the main magazine and the sorts case.

Vijapure Fount for Linotype Devanagari

367. The standard Vijapure fount scheme for slug composition, as finalised on the basis of the latest decision of the Government of India (1960) and that of the Government of Maharashtra (1962) on the Devanagari Script, is given overleaf. I have made certain suggestions regarding the reduction of 89 sorts by making slight alterations in the method of constructing certain letters including conjuncts. These suggestions can easily be accepted for news-paper setting with only the main keyboard of 90 channel layout. The original scheme, as given in table 67 with *Mātrā* letters in side case, will be suitable for Book-work. For further refinement the *Ukāri* letters can be added in the side case.

* *See* Table 60. Comparative study of the decisions on the standard Alphabet for Devanagari, pp. 354-361.

Table 67. **Vijapure Devanagari for Hindi and Marathi**

Classification	*Devanagari for Hindi* — *Letters with a verti-bar*	*Letters with a short-bar*	*Letters with central-bar*	*Replacement for Marathi*	Common	Hindi only	Marathi only
1	2	3	4	5			
1 Vowels	ऊ	इ उ ए ऐ (ऋ)		ऋ	5	1	1
2 Half consonants	ख ग ह च ज झ ञ ण त थ ध न प ब भ म य ल ट व श ष स क्ष ज्ञ	ङ् (छ) ट ठ ड ढ [ड़] [ढ़] द् र ह ळ	व = ँ ः	छ प	39	1 [2]	1
3 *Mātrās*	ा ि ी ु ू ृ े ै ो ौ ं ँ ॅ ॉ	ा ॅ े ै ॉ ॅ ॉ	ृ		27	..	..
4 *Chandra*	ॅ ॉ	ॅ ॉ	ॅ ॉ		6	..	..
5 Conjuncts of र	क्र ट्र ड्र ह्र ष्र श्र	द्र ह्र (छ्र)	व्र	छ्र	12	1	1
6 *Rāfari*	र्क र्ख र्ग र्घ र्च र्ज र्झ र्ट र्ड र्ढ र्त र्द	र्ठ र्ण र्थ र्ध र्ब र्भ र्म र्ल र्व र्श र्ष र्स र्ह	र्ङ र्ञ		22	..	..
7 *Ukāri*			कु क्रु पु फ्रु		4	..	..
8 *Mātrā* consonants	खे गे घे चे जे झे णे तृ थे धे नै बे भे मे रे ले शे वे से क्षे ज्ञे	(छे) टे ठे डे ढे [ड़े] [ढ़े] दे रे हे ळे [हैं]	वै पे	छे	34	1 [3]	1
9 Special *mātrās*	ि ि	ॅ	ॅ ॅ		4	..	..
					153	4 [5]	4
10 Figures	१ २ ३ ४ (५) ६ ७ (८) ९ ०			५, ८	8	2	2
11 Signs	, ; . ! ? ! : ' ऽ - / * ( )			..	14	..	..
12 Spaces	en sp. em sp. thick sp.	..			3	..	..
					25	2	2
					178	6 [5]	6

A Scheme for Further Reduction in the Number of Sorts

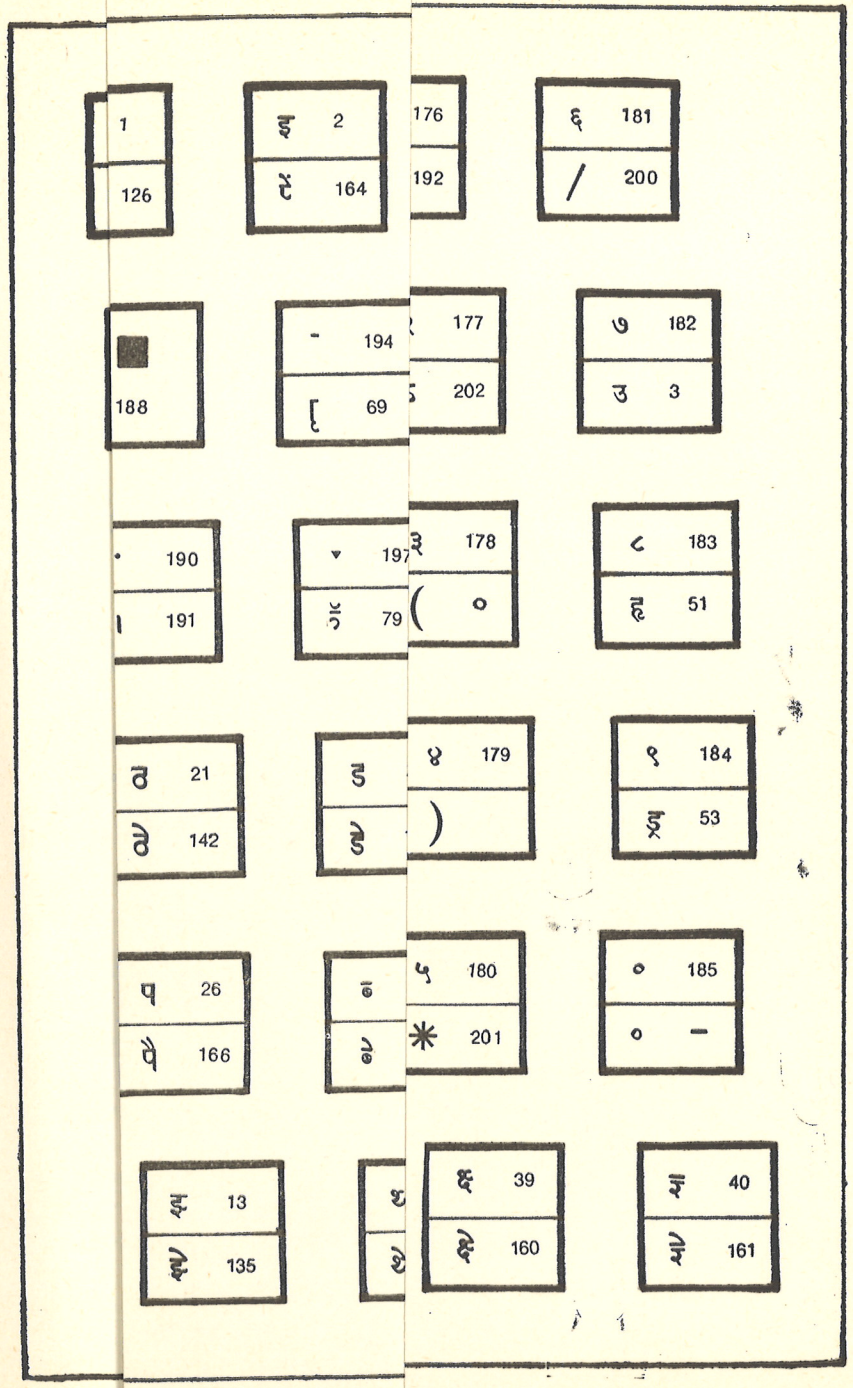
368. My proposal for reduction of sorts is mainly based on elemination of *Rafāri* characters, replacement of full र conjuncts with linear setting, introduction of *Bārākhadi* of अ and providing full *Kānā* to क and फ. The following notes refer to the table 67 on page 418.

Notes— 1. The characters in column 3 in brackets [ ] are additions for Hindi.

		—	+
2.	Characters (5) shown in parenthesis in column 3 are used only in Hindi. Four of them (except है) are replaced by those in column 5 for Marathi composition.		
3.	Acceptance of *Swarākhadi* will replace 5 matrices ऋ, इ, उ, ए and ऐ and will add one ॅ इमान = अिमान; उत्तम = अुत्तम; एक = अेक; ऐक = अैक; ऋण = अृण or ऱुण	5	1
4.	Replacement of *Rafār* combinations by prefixing *Rafār*, accented ः or *halant* ् will reduce 22 matrices against Serial No. 6 and will retain one (ँ, ः or ्) धर्म = धरम धऱम or धँम	22	1
5.	Replacement of conjuncts with full र against S. No. 5 (except ह्र, ट्र, श्र, छ्र and व्र required for कृ) with linear setting will reduce 8 matrices. पत्र; = पत्र; प्रकार = प्रकार; ब्रम्हा = ब्रम्हा; तीव्र = तीव्र; राष्ट्र = राष्ट्र; ड्रामा = ड्रामा; द्राक्ष = द्राक्ष	8	—
6.	The provision of verti-bar to half forms of क and फ (का फा) will replace 17 matrices in addition to 2 *Rafāri* (र्क, र्फ) included against Note No. 4 above. It will then be necessary to provide ि, ेा and ैा and retain ः for combinations like द्‌न्‌व for द्व. का, कि, की, कु, कू कृ फा, फि, फी, फु, फू	17	3
7.	Eliminating the compounds क्ष and ज्ञ (and क्षे ज्ञे) in favour of linear setting of these conjuncts will reduce the matrices by 4. क्षमा = क्षमा; ज्ञान = द्‌न्यान or ग्यान	4	—
8.	Use of *kānā-mātrā* and *mātrā* (ॅ and ॅ) for the *mātrā* consonants (Serial No. 8 in the table except है) will reduce the matrices by 31 for Hindi exclusive of 4 वै, पै, वे, पे reduced as per Note No. 6 above, and क्षे ज्ञे reduced as per note 7 above.	31	—
9.	The above suggestion (Note 8) will necessitate provision of 3 matrices. ँ ॅ ॅ in place of ँ ः ् (and र्‌ at note No. 4) to be discarded.	3	3
		90	8

The net reduction of Matrices is 81 and the number of matrices, after these reforms are implemented, will be only 101 for Hindi and 96 for Marathi.

Greek Attachment Linotype Devanagari Keyboard designed by the Author. (*See* opposite page 420*a*)



Devanagari Key-board desig

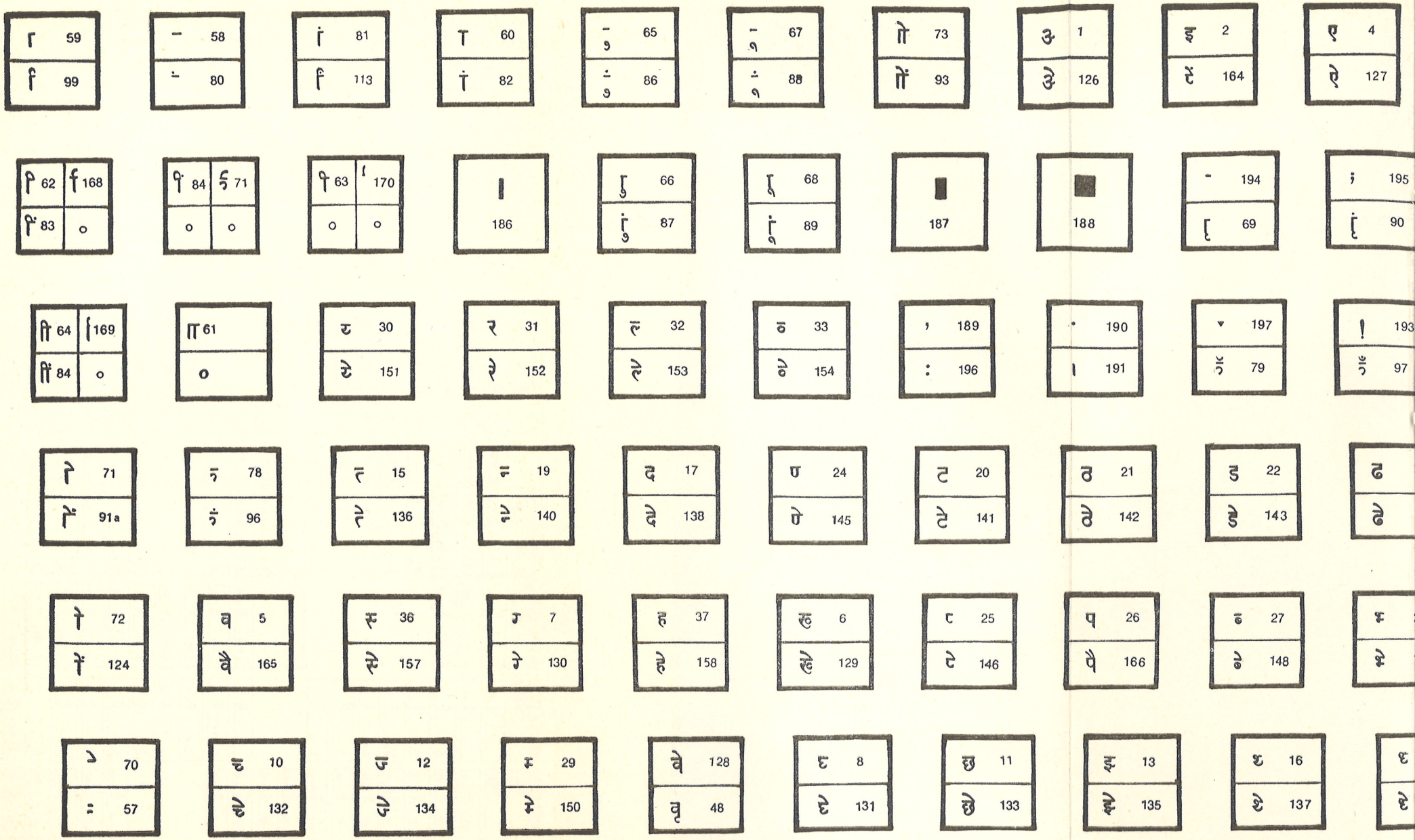
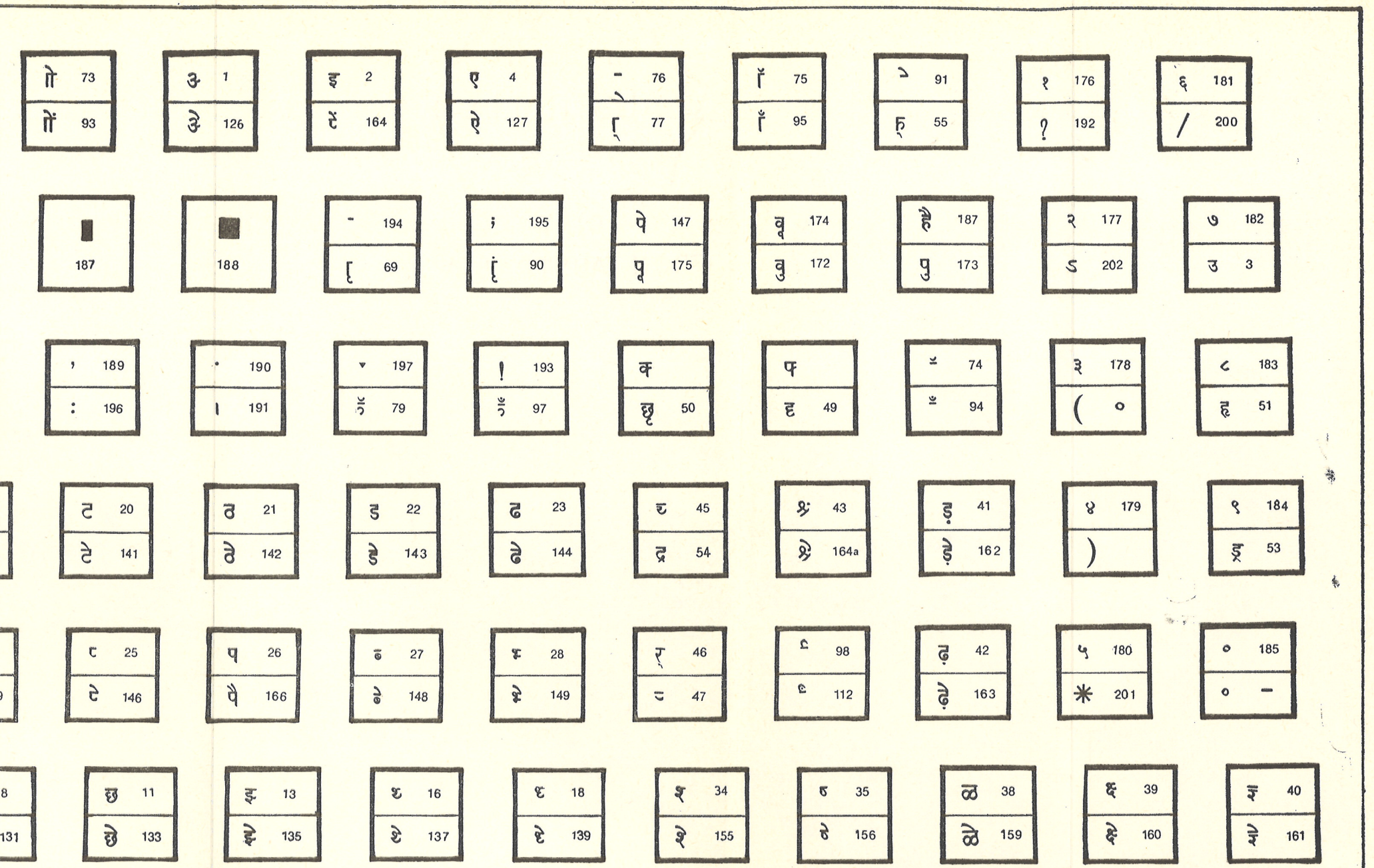


Fig. 138. **Greek Attachment Linotype Devanagari Key-board designed by the Author.**

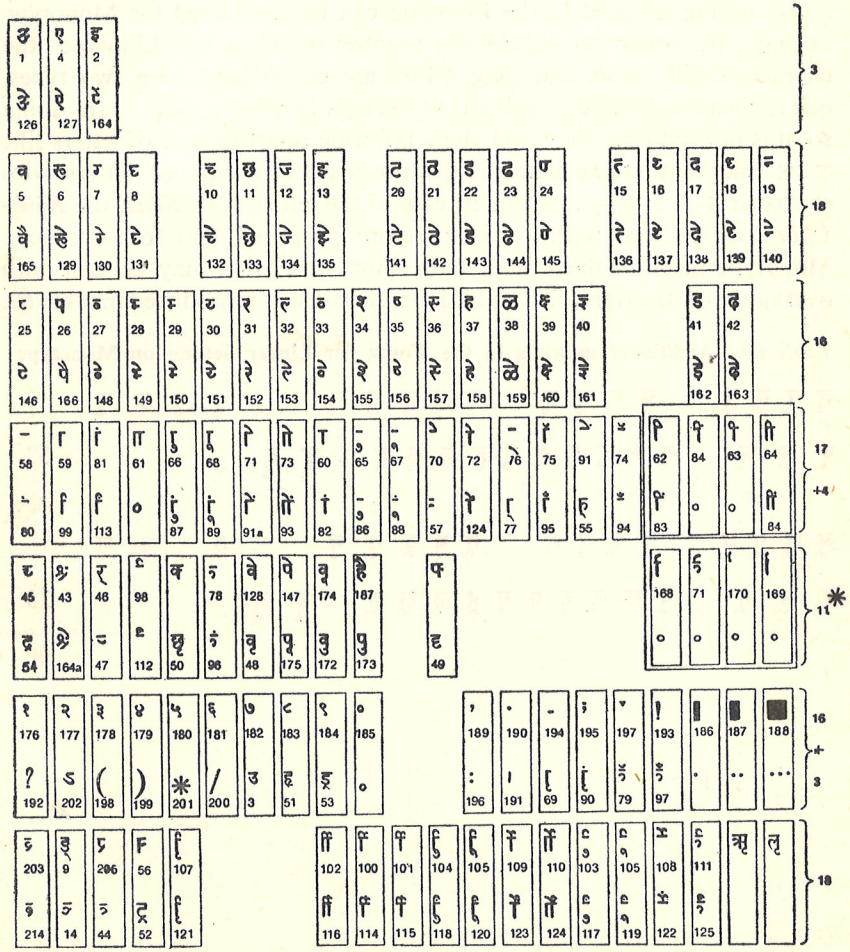


Greek Attachment Linotype Devanagari Key-board designed by the Author.

LINOTYPE DEVANAGARI KEYBOARD FOR GREEK ATTACHMENT

369. Last stage of the Vijapure scheme submitted to the Linotype & Machinery Co., has yet to be implemented. On the basis of the study undertaken by me, in adaptation of Devanagari to Slug Composing Machines based on the frequency count carried out, a new revised keyboard is worked out (fig. 138). Characters in the main positions are arranged according to frequency and alphabet classification. Those in the italic position include *mātrā* characters.

Table 68. **Fount of Matrices for Linotype Greek Attachment**



* These four matrices are to be substituted for the four matrices in the row above, for short "*i*" combinations in the improved style.

A Scheme for Linear Setting on Monotype

370. In the Monotype system of type setting the over hanging characters predominate. The method of setting on Monotype has been explained at page 393 and a complete sorts-list with the comments has been reproduced on pages 394-397. As has already been stated, the setting system adapted on the Monotype helps in retaining the conventional look of the script but the large number of overhangs create problems. It is therefore necessary to formulate a linear setting method without overhangs or at least with very few overhangs. The Vijapure system of linear setting adapted to the Linotype can be considered for Monotype setting. In order to reduce the number of sorts on Linotype the characters with short and long *Ukārs* are constructed with two types, one is consonants and the other is vowel sign in त+ु ; त+ू . In doing so, it is noticed that the vowel signs fall wide apart in case of letters like क, फ and they create disturbing white spaces in case of letters with short-bar ठ+ु ; द+ु . Even in case of the letters with *Kānā*, the *Kānā-Ukār* does not look well. It is therefore proposed that for setting on Monotype machine the *Ukārs*, both short and long, may be cast with overhangs on the right. The additional sorts-list is reproduced in table 69.

Table 69. **Additional matrices in the Fount for Linear Setting on Monotype**

अु खु गु घु चु छु जु झु तु थु दु धु नु टु ठु डु ढु णु	
बु भु मु यु रु लु शु षु सु हु ळु क्षु ज्ञु ड़ु ढ़ु	33
अू खू गू घू चू छू जू झू तू थू दू धू नू टू ठू डू ढू णू	
बू भू मू यू रू लू शू षू सू हू ळू क्षू ज्ञ़ ड़ू ढ़ू	33
	66

Table 70. **Comparative study of the matter set up by hand and on Mechanical Composing Machines**

Handset 12 pt., 2 pt. leaded

महाराष्ट्राच्या भक्तिसंप्रदायात भागवत पंथ, लिंगायत पंथ, वारकरी पंथ, महानुभावी पंथ इत्यादी पंथ निर्माण झाले. त्या सर्वांत जुना नाथपंथ आहे. या नाथपंथाची गाणी गाणारा एक खेडूत कलाकार महाराष्ट्रात ज्ञानेश्वरांच्या पूर्वीपासून संचार करीत आहे. त्याचे नाव कानफाट्या किंवा कोकेवाला.

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Monotype 12 on 14 pt.

महाराष्ट्राच्या भक्तिसंप्रदायात भागवत पंथ, लिंगायत पंथ, वारकरी पंथ, महानुभावी पंथ इत्यादी पंथ निर्माण झाले. त्या सर्वांत जुना नाथपंथ आहे. या नाथपंथाची गाणी गाणारा एक खेडूत कलाकार महाराष्ट्रात ज्ञानेश्वरांच्या पूर्वीपासून संचार करीत आहे. त्याचे नाव कानफाट्या किंवा कोकेवाला.

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Linotype 12 on 13 pt.

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Intertype 12 pt.

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Part Four

Frequency Studies of Devanagari Graphemes and Type Sorts

(Chapter XVI and Tables 71 to 75)

CHAPTER XVI

GRAPHEMIC FREQUENCIES OF DEVANAGARI

371. The frequencies of the letters of the alphabet determine the relative quantity of type and the location of the sorts in the type case. The same data can be made use of in formulating the keyboards for typewriters and the composing machines. Intensive studies have been made in case of the Roman alphabet in its use for the various languages. Prof. S. H. Caldwell carried out studies in the Chinese language with a view to develop a composing machine for Chinese. His studies were incorporated in his paper[1] presented to the Franklin Institute of Pennsylvania. Prof. Caldwell's work on Devanagari was financed by the Carnegie Corporation of New York and the results were published in the Graphic Arts Research Foundation Reports[2] during 1953-54. The United States Army and Air Force have taken keen interest in the study of the languages of the Far East. The mass communication division of the UNESCO is also interested in the studies in respect of Devanagari and other Oriental languages. Louis Rosenblum has recently produced a report[3] on Devanagari Photo-composition with the assistance of Centre of Communication Sciences and Graphic Arts Research Foundation Inc., Massachusetts Institute of Technology.

SIGN LIST OF DEVANAGARI *Akṣaras*

372. The Devanagari script, which has been fully explained in the pages which precede, is of semi-syllabic nature. The graphic units known as *akṣaras* are constructed by combining the vowel-signs with the consonants. There are twelve vowels including ऌ, and ॠ, but excluding अं and अः. When they combine with the thirty-six consonants, 432 graphic units or *akṣaras* are formed. The conjuncts, which are graphic units, made of more than one consonants combined with a vowel-sign, are many. As many as 378 conjuncts are listed by Lambert in her study of the Devanagari script.[4] The possible number of conjuncts multiplied by 12 vowel-signs works out to 4,536 *jod-akṣaras*. The *akṣaras* (about 5,000) may also be used with *anuswār* which will increase the number to almost double. It has however been estimated that about 2,000 *akṣaras* would be needed for satisfactory setting of Devanagari, the remaining being very infrequent.

Necessity of Frequency Count of the Devanagari Graphemes

373. So far the basic data required for formulating the fount schemes used to be worked out by a very practical method. Set-up matter of representative character is distributed in an empty case and the number of types in each compartment is counted. Similar study has recently been carried out by David Ray who visited India on behalf of the South Illinois University, U.S.A. This method is not very scientific as one has to rely on whatever set-up matter is available. The frequencies of type sorts, worked out under a specific method of type-setting cannot be applied to the other methods of type-setting. For instance the frequencies worked out for the *degree* type fount of 155 type-sorts will not be applicable in case of *Akhand* type fount of 600 type-sorts. They will have to be worked out afresh.

374. I, therefore, thought it necessary to work out the graphemic frequencies of Devanagari on the basis of the complete graphemic units. The graphemic units in Devanagari may amount to about 10,000 as already stated. Once these graphemic units are counted and tabulated in an easily understandable chart, all the basic information necessary for the study of the graphemic structure of Devanagari script would be available. The Report of Rosenblum referred to above envisages working out of graphemic frequencies of 1,00,000 words specifically selected for the purpose. He further recommends working out of frequencies of *akṣara*-sequences "…. to establish the optimum keyboard layout. By maximising the alternation of hands in successive key-strokes, by maximising the keyboarding in the central horizontal row of the typewriter and by minimising the sequences from top to bottom row in the same hand, it will be possible to minimise the operator-fatigue, minimise operator-errors and maximise operator-speed".

Explanation of the Frequency Tables

375. Although I originally proposed to work out the frequencies of 1,00,000 words I could not wait till the passages were selected on random sampling basis. I therefore limited my studies to three groups of words. (1) 10,000 words from the passages selected by the Language Department of the Maharashtra Government for working out the graphemic frequencies for developing a standard typewriter keyboard,* (2) passages covering 5,000 words from a daily newspaper in Marathi, * (3) passages covering 5,000 words from a daily newspaper in Hindi. In order to have a comparative study of the graphemic frequencies worked out under these three groups, the frequency figures for the second and the third groups are doubled. The basic data collected is tabulated in table 71. The totals thus represent 30,000 words. The data is retabulated in tables 72 and classified under (A) *Akṣaras* representing vowels only, (B) central-bar letters, (C) short-bar letters, (D) verti-bar letters and (E) letters with *Nukta*, (F) special compounds. Conjuncts are tabulated in table 73. The totals are tabulated on pages 464-65. The figures are horizontally arranged according to the vowel sequence in four groups : (1) twelve vowels, *Bārākhadi*, (2) nine vowels आ to औ with *anuswār*, (3) special vowels अॅ and अॉ, with and without *anuswār*, (4) vowels ऋ and ऌ, and (5) semi-vowels या with and without *anuswār*.

*These passages were written according to the New Rules of Orthography of Marathi.

376. The information in 72-73 tables has been made use of in working out the matrix frequencies. All the graphemes were analysed on the basis of 188 matrices in the Vijapure system of the slug composition. The data worked out is tabulated in table 74, arranged according to the frequency percentages. Cumulative percentages are also given. It will be seen that first ten matrices represent over fifty per cent of the key-strokes. First thirty matrices cover eighty-four per cent of the key-strokes and seventy matrices, which can be accommodated on the Linotype keyboard, in addition to the spaces, a few signs and numerals, cover 97·47 per cent of the key-strokes. The main purpose of this frequency count is to formulate a standard keyboard for the Linotype machine. Similar use can be made of the tables 72-73 for developing the standard keyboard for Monotype or other type-composing or photo-setting machines and for different systems of hand-setting.

Basic Data from the Frequency Count

377. The information which may be available from such a study of frequencies is of great use for linguistic studies. Orthographic scrutiny is, however, required to be made before the frequency count of 1,00,000 words is undertaken. It is possible to study the effect of the rules of orthography recently accepted by the Government of Maharashtra on the frequencies. For that purpose it would be necessary to select and re-write passages according to different rules of orthography.

378. The following basic information is available from the study carried out :

(1) The number of words studied	30,000
(2) Number of non-conjunct letters	79,933
(3) Number of conjunct letters	6,639
(4) Number of graphemic units (1+2)	86,572
(5) Half consonants used in conjuncts (includes first and middle members).	6,852
(6) Total number of key-strokes in the Vijapure system of Linotype setting of 30,000 words.	1,93,526

Relative Frequencies

379. Average word is made of 2·9 *akṣaras* and 6·4 key-strokes in Vijapure method, exclusive of spaces in the Vijapure Linotype system. "क" is the most frequent letter followed by र, न, त, स, ल, ह, म, व, च, in that order. The most frequent vowel-sign is अ followed by आ, ए, ई, इ, उ, ओ, ऊ, ए and औ in that sequence. The frequency of the *akṣaras* ending with semi-vowel या is between that of इ and उ. The frequencies of the consonants, particularly the relative frequencies are of special interest to the script reformers as the effect of any alteration in the design of a particular consonant can be pre-judged with this data.

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1. Caldwell, S. H., *The Sinotype—A Machine for the Composition of Chinese from a Key-board*, Journal of the Franklin Institute, Pennsylvania 267, No. 6 (1959).
2. Caldwell, S. H., *Final Report on Studies.... Chinese and Devanagari*, Graphic Arts Research Foundation, New York (1954).
3. Louis Rosenblum, *Proposed Programme for the Development of Photographic Type-setting Machines for India.*
4. Lambert, H. M., *Introduction to the Devanagari Script*, Oxford University Press, 1953.

TABLES OF THE GRAPHEMIC FREQUENCIES OF DEVANAGARI

Table 71.—Graphemic frequencies 30,000 words, classified as (*a*) Bhasha Mandal, (*b*) Marathi Newspapers and (*c*) Hindi Newspapers.

Table 72.—Arranged vertically, according to the groups of letters (A) Vowels only (B) Letters with central-bar, (C) short-bar letters, (D) verti-bar letters, (E) consonants with *Nukṭa* (F) special compounds and are arranged horizontally according to the vowel sequence, i.e.—

(1) Ten vowels and the *visarga.*

(2) Ten vowels with the *anuswāra.*

(3) Special vowels अॅ and आॅ with and without the *anuswāra.*

(4) Vowels ऋ and ऌ

(5) Semi-vowel या with and without the *anuswāra.*

(*a*) The figures in bold in the second lines against the consonants, refer to the frequencies of conjuncts having the relative consonant as last member.

(*b*) The frequencies of the consonant graphemes as first (or middle) member in conjuncts are shown in the last but one column.

(*c*) The totals of the four tables are worked out on page 464-465, represent the *akṣharas* or graphemic units as represented in Devanagari writing.

Table 73.—Graphemic frequencies of the conjunct letters in Devanagari and *Rafāri* conjuncts.

Table 74.—Linotype matrix frequencies in the Vijapure Method worked out in percentages.

Table 75.—Frequencies of *Ukāri* letters for Monotype linear setting.

Table 71. **Graphemic Frequencies of 30,000 words**

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
अ	549	608	368	1,525
आ	720	846	298	1,864
इ	56	62	164	282
ई	89	88	108	285
उ	178	200	254	632
ऊ	44	30	..	74
ए	135	130	192	457
ऐ	7	12	38	57
ओ	8	8	26	42
औ	18	10	92	120
अं	35	18	4	57
आं	2	10	14	26
इं	13	14	14	41
ईं	..	..	1	1
उं	2	4	..	6
ऊं	..	30	6	36
एं	..	..	4	4
ओं	..	2	38	40
ॲ	1	2	..	3
ऑ	2	14	..	16
अँ	3	..	..	3
आँ	..	2	..	2
ऋ	..	..	2	2
				5,575
क	877	1,110	870	2,857
का	619	610	584	1,813
कि	33	52	306	391
की	85	36	40	161
कु	58	18	12	88
कू	35	10	518	563
के	106	126	2	234
कै	2	10	142	154
को	70	62	..	132
कं	11	8	..	19
कां	40	156	6	202
किं	27	14	2	43
कीं	..	4	..	4
कूं	..	4	..	4
कें	28	18	2	48
कों	1	..	38	39
कॅ	..	4	..	4
कॉ	14	4	..	18
काँ	10	..	..	10
कृ	8	2	12	22
क्या	5	4	10	19
क्यां	2	2	..	4
				6,829
ख	126	78	76	280
खा	71	86	28	185
खि	4	12	2	18
खी	22	20	..	42
खु	1	4	8	13
खू	10	6	..	16
खे	37	14	8	59
खै	5	..	..	5
खो	9	4	8	21
खं	8	2	6	16
खां	2	2	6	10
खिं	2	..	..	2
खें	..	..	2	2
खाँ	1	..	..	1
ख्या	25	8	8	41
				711
ग	260	292	456	1,008
गा	119	104	112	335
गि	41	16	22	79
गी	12	44	52	108

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
गु	15	24	20	59
गू	4	4	4	12
गे	46	44	28	118
गै	13	4	12	29
गो	25	38	20	83
गौ	..	4	..	4
गं	2	2	2	6
गां	16	28	8	52
गीं	..	4	..	4
गुं	1	2	..	3
गें	..	2	..	2
गों	..	..	8	8
गृ	18	4	..	22
ग्या	3	..	..	3
				1,935
घ	34	74	28	136
घा	34	80	6	120
घि	2	4	..	6
घी	1	..	2	3
घु	..	2	..	2
घू	17	..	..	17
घे	36	38	..	74
घो	1	4	6	11
घं	..	2	2	4
घां	1	6	..	7
घुं	..	..	4	4
घ्या	3	4	..	7
				391
च	203	252	104	559
चा	287	246	144	677
चि	19	102	8	129
ची	236	214	14	464
चु	4	2	14	20
चू	..	16	2	18
चे	210	180	6	396
चै	3	..	..	3
चो	2	2	..	4
चौ	1	..	..	1
चं	6	..	..	6
चां	11	14	4	29
चिं	1	2	4	7
चीं	..	10	..	10
चें	..	96	..	96
च्या	420	278	..	698
च्यां	..	2	..	2
				3,119
छ	..	38	42	80
छा	6	56	..	62
छि	..	..	4	4
छी	..	..	2	2
छै	..	2	..	2
छो	29	26	4	59
छः	..	..	2	2
छिं	..	..	10	10
				221
ज	314	270	234	818
जा	152	70	168	390
जि	57	48	54	159
जी	36	56	66	158
जु	8	2	8	18
जू	17	24	12	53
जे	86	4	4	94
जै	..	8	..	8
जो	13	56	20	89
जं	12	..	..	12
जां	7	4	2	13

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
जूं	2	6	..	8
जों	..	..	4	4
ज्या	56	12	..	68
ज्यां	7	4	..	11
				1,903
झ	1	4	6	11
झा	78	108	16	202
झि	..	4	4	8
झी	..	6	..	6
झु	1	..	2	3
झे	1	4	4	9
झो	1	2	..	3
झां	..	..	4	4
झुं	..	..	2	2
झ्या	..	6	..	6
				254
ट	147	188	146	481
टा	29	34	14	77
टि	7	12	2	21
टी	42	14	4	60
टु	1	2	..	3
टे	17	22	22	61
टो	7	4	4	15
टौ	..	..	4	4
टां	5	12	..	17
टीं	..	2	..	2
टुं	6	..	..	6
टूं	2	4	..	6
टें	..	12	..	12
टों	..	..	2	2
टॅ	1	..	..	1
ट्या	15	4	..	19
ट्यां	3	4	..	7
				794

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
ठ	63	50	6	119
ठा	31	18	14	63
ठि	6	22	4	32
ठी	126	66	2	194
ठु	..	2	..	2
ठे	26	26	..	52
ठो	2	..	2	4
ठां	4	2	..	6
ठीं	..	12	..	12
ठ्या	29	8	..	37
ठ्यां	1	..	..	1
				522
ड	121	156	48	325
डा	25	22	32	79
डि	4	2	2	8
डी	39	12	18	69
डु	..	2	..	2
डे	35	22	..	57
डो	54	38	20	112
डां	5	22	14	41
डुं	7	2	..	9
डें	1	..	..	1
डों	..	..	6	6
डॉ	..	..	2	2
ड्या	26	..	..	4
ड्यां	17	..	..	26
				17
				758
ढ	72	52	14	138
ढा	7	6	10	23
ढी	18	6	..	24
ढु	13	2	..	15
ढे	10	36	..	46

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
ढं	...	..	4	4
ढां	1	..	...	1
ढें	..	6	..	6
ढ्या	3	2	...	5
				262
ण	256	388	168	812
णा	191	260	36	487
णि	130	84	..	214
णी	119	36	12	67
णु	1	2	2	5
णू	42	38	..	80
णे	120	18	..	138
णो	1	..	..	1
णं	1	..	..	1
णां	2	20	..	22
णीं	..	12	..	12
णें	..	36	..	36
ण्या	291	138	..	429
ण्यां	1	62	—	63
				2,367
त्	..	2	10	12
त	1,168	1,232	464	2,864
ता	274	146	162	582
ति	57	110	86	253
ती	388	236	68	692
तु	28	18	34	80
तू	66	14	142	222
ते	89	182	..	271
तै	5	..	4	9
तो	63	78	44	185
तौ	..	..	2	2
तं	15	6	..	21
तः	15	22	46	83

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
तां	8	70	..	78
तीं	3	20	..	23
तूं	..	2	..	2
तें	..	32	2	34
तों	1	8	6	15
तॄ	4	..	..	4
त्या	195	152	..	347
त्यां	51	88	..	139
				5,918
थ	24	20	56	100
था	8	20	68	96
थि	1	..	..	1
थी	5	4	8	17
थु	1	..	..	1
थे	18	32	10	60
थै	1	..	..	1
थो	11	8	6	25
थं	1	..	..	1
थां	2	4	..	6
थीं	1	..	2	3
थें	..	18	..	18
थों	..	..	2	2
थ्या	1	..	..	1
				332
द्	..	26	2	28
द	176	196	154	526
दा	113	110	74	297
दि	75	90	112	277
दी	38	16	48	102
दु	56	20	28	104
दू	31	..	26	57
दे	125	166	90	381
दै	5	34	..	39

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
दो	29	10	14	53
दौ	1	2	..	3
दं	1	6	12	19
दः	1	4	..	5
दां	6	18	..	24
दीं	1	2	..	3
दें	..	2	6	8
दौं	..	..	4	4
दृ	21	42	4	67
द्या	85	78	6	169
द्यां	14	10	..	24
				2,190
ध	134	52	30	216
धा	86	30	70	186
धि	53	78	62	193
धी	40	30	8	78
धु	7	10	2	19
धू	5	12	..	17
धे	6	2	2	10
धो	11	10	..	21
धं	33	54	..	87
धः	...	...	4	4
धां	1	2	..	3
धीं	...	2	..	2
धुं	2	...	..	2
धूं	..	...	2	2
धें	...	..	2	2
ध्या	14	14	10	38
ध्यां	...	2	...	2
				882
न्	..	..	2	2
न	696	724	604	2,024
ना	336	474	304	1,114

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
नि	131	140	156	427
नी	78	134	116	328
नु	32	32	10	74
नू	1	..	..	1
ने	274	218	400	892
नै	5	2	..	7
नो	8	14	2	24
नं	30	38	2	70
नः	3	4	4	11
नां	34	34	6	74
निं	..	..	2	2
नीं	..	2	..	2
नें	..	68	12	80
नों	4	..	52	56
नृ	..	..	4	4
न्या	15	18	22	55
न्यां	11	14	..	25
				5,272
प	550	676	420	1,646
पा	249	210	102	561
पि	21	..	10	31
पी	19	4	..	23
पु	95	92	86	273
पू	63	82	50	195
पे	16	30	6	52
पै	15	28	10	53
पो	6	12	6	24
पौ	..	2	..	2
पं	52	2	4	58
पां	2	10	4	16
पूं	..	2	..	2
पें	1	2	..	3
पों	..	2	...	2
पॅ	1	...	...	1

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
पॉ	—	2	..	2
पृ	3	4	..	7
				2,951
फ	15	26	32	73
फा	49	28	4	81
फि	2	6	14	22
फी	2	8	4	14
फु	1	4	4	9
फू	11	...	4	15
फे	6	4	10	20
फै	2	..	—	2
फो	2	...	2	4
फौ	...	2	—	2
फॅ	...	2	—	2
फॉ	...	2	—	2
				246
ब	198	142	224	564
बा	105	106	104	315
बि	14	4	20	38
बी	13	12	8	33
बु	3	8	...	11
बू	5	10	4	19
बे	7	2	12	21
बै	1	...	2	3
बो	5	24	4	33
बं	53	18	24	95
बां	35	2	4	41
बीं	3	2	...	5
बें	..	..	2	2
बों	..	...	2	2
बॅ	1	—	—	1
बॅ	4	—	—	4

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
बृ	2	...	..	2
ब्या	1	...	...	1
				1,190
भ	38	82	44	164
भा	189	130	132	451
भि	10	34	16	60
भी	2	...	146	148
भु	4	...	..	4
भू	13	32	10	55
भे	10	6	8	24
भो	3	...	...	3
भौ	—	2	..	2
भं	1	2	..	3
भां	4	12	..	16
भें	1	..	2	3
भों	—	2	2	4
भृ	—	2	..	2
भ्या	14	4	..	18
				957
म	405	554	332	1,291
मा	320	358	100	778
मि	133	126	80	339
मी	90	42	44	176
मु	137	310	130	577
मू	16	6	..	22
मे	19	28	20	67
मै	9	2	2	13
मो	41	72	..	113
मौं	..	2	8	10
मं	25	50	42	117
मां	16	14	38	68
मीं	...	2	..	2
मुं	21	8	—	29

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
में	6	12	390	408
मैं	..	..	2	2
मों	..	..	12	12
मृ	1	4	4	9
म्या	1	..	..	1
				4,034
य	260	214	288	762
या	243	280	260	783
यि	7	12	6	25
यी	17	24	32	73
यु	20	22	4	46
यू	..	..	8	8
ये	119	98	176	393
यो	148	52	32	232
यं	19	16	8	43
यः	..	..	2	2
यां	77	106	2	185
यीं	4	..	..	4
यें	..	2	14	16
यों	..	..	58	58
य्या	10	..	..	10
				2,640
र	1,303	1,248	1,220	3,771
रा	262	364	190	816
रि	109	154	106	369
री	216	210	92	518
रु	48	24	14	86
रू	98	102	66	266
रे	92	68	48	208
रो	54	26	32	112
रौ	..	..	2	2
रं	18	46	36	100
रां	39	88	2	129
रिं	6	..	2	8
रीं	3	2	..	5
रूं	..	16	..	16
रें	..	16	10	26
रों	..	..	52	52
र्या	109	50	..	159
र्यां	26	2	..	28
				6,671
ल	543	512	430	1,485
ला	359	404	160	923
लि	9	20	128	157
ली	185	148	34	367
लु	..	4	6	10
लू	20	18	18	56
ले	185	362	92	639
लै	2	..	..	2
लो	39	30	30	99
लौ	2	..	..	2
लं	9	6	..	15
लां	19	10	2	31
लिं	1	10	..	11
लीं	..	2	..	2
लें	..	60	4	64
लों	..	4	16	20
लॉ	1	..	..	1
ल्या	232	160	8	400
ल्यां	6	..	..	6
				4,290
व	711	634	452	1,797
वा	275	208	134	617
वि	336	234	166	736
वी	62	60	4	126
वु	1	..	..	1

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
वू	17	24	..	41
वे	118	166	86	370
वै	7	22	4	33
वो	..	10	..	10
वं	1	34	16	51
वां	4	2	..	6
वूं	..	14	..	14
वें	..	16	4	20
वों	..	..	30	30
वृ	3	10	6	29
व्या	66	30	2	98
व्यां	3	2	..	5
				3,984
श	115	210	116	441
शा	122	118	36	276
शि	69	116	38	223
शी	69	80	14	163
शु	1	2	8	11
शू	1	4	..	5
शे	101	20	22	143
शै	2	..	..	2
शो	8	4	..	12
शौ	1	..	..	1
शं	1	6	2	9
शां	5	..	..	5
शिं	1	12	..	13
शीं	..	4	..	4
शें	..	2	..	2
शों	..	..	18	18
श्या	1	4	2	7
				1,335
ष	73	22	..	95
षा	2	4	..	6
षि	3	..	2	5
षे	2	..	..	2
षो	..	4	..	4
षं	2	..	..	2
षां	1	2	..	3
षें	1	..	..	1
ष्या	1	2	..	3
ष्यां	..	2	..	2
				123
स्	..	6	..	6
स	753	756	708	2,217
सा	338	288	166	792
सि	13	16	32	61
सी	8	4	14	56
सु	87	56	46	189
सू	82	62	16	160
से	116	62	196	374
सै	5	..	2	7
सो	47	20	6	73
सौ	..	..	6	6
सं	138	164	82	384
सां	17	22	2	41
सिं	..	..	12	12
सुं	..	6	..	6
सें	..	32	4	36
सों	..	2	6	8
सौं	..	4	4	8
सृ	..	4	..	4
स्या	1	8	4	13
स्यां	7	..	..	7
				4,460
ह	150	142	334	626
हा	123	206	150	479

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
हि	103	238	64	405
ही	208	178	90	476
हु	11	8	86	105
हू	21	6	..	27
हे	296	378	38	712
है	..	..	368	368
हो	199	186	146	531
हं	2	2	..	4
हां	1	4	24	29
हिं	4	8	6	18
ही	..	30	88	118
हुं	..	..	8	8
हूं	..	6	12	18
हें	..	22	2	24
हैं	..	..	64	64
हों	1	..	8	9
हॉं	..	..	4	4
				4,140
ह	2	8	..	10
ह्या	50	50	..	100
ह्यां	5	..	..	5
				595
ळ	135	90	..	225
ळा	57	34	..	91
ळी	34	14	..	48
ळू	14	8	..	22
ळे	87	30	..	117
ळो	1	2	..	3
ळं	..	2	..	2
ळां	5	8	..	13
ळीं	..	10	..	10
ळूं	..	2	..	2
ळें	..	16	..	16
ळ्या	16	10	..	26
ळ्यां	2	18	..	20
				595

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
क्ष	98	120	40	258
क्षा	25	16	18	59
क्षि	4	8	8	20
क्षी	1	4	2	7
क्षु	1	..	..	1
क्षे	34	26	26	86
क्षै	..	2	..	2
क्षां	1	6	..	7
क्ष्या	..	..	2	2
				442
ज्ञ	..	..	6	6
ज्ञा	2	8	8	18
ज्ञां	1	..	..	1
ज्ञों	..	..	4	4
				29
श्र	2	..	10	12
श्रा	3	..	..	3
श्रि	..	..	2	2
श्री	6	82	42	130
श्रु	..	4	..	4
श्रे	8	2	4	14
श्रो	..	2	..	2
श्रां	1	..	..	1
श्रृ	...	1	..	1
				169
त्र	43	78	36	157
त्रा	38	12	6	56
त्रि	14	2	2	18
त्री	15	8	14	37
त्रू	1	6	..	7
त्रे	7	..	..	7
त्रां	6	28	..	34

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
त्रें	..	4	..	4
त्रो	..	..	16	16
त्र्या	4	..	..	4
त्र्यां	4	..	...	4
				344
ड़	..	..	24	24
ड़ा	..	..	6	6
ड़ि	..	..	2	2
ड़ी	..	..	2	2
				34
ढ़	..	..	12	12
ढ़ी	..	..	2	2
				14
क्क	8	..	4	12
क्का	1	4	..	5
क्के	15	2	2	19
क्कां	1	..	...	1
				37
क्च	1	..	...	1
क्ट	..	6	8	14
क्टू	..	..	2	2
क्टो	1	..	..	1
				17
क्त	21	22	46	89
क्ता	1	..	..	1
क्ति	1	14	20	35
क्ती	13	8	..	21
क्तृ	..	..	2	2
क्तें	..	2	..	2
क्तृ	..	6	..	6
क्त्या	1	..	...	1
क्त्यां	..	2	..	2
				159

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
क्य	12	2	2	16
क्यु	3	..	10	13
क्यू	..	..	2	2
क्यों	..	..	6	6
				37
क्र	25	36	14	75
क्रा	1	4	..	5
क्रि	8	..	16	24
क्री	6	..	2	8
क्रे	..	..	2	2
क्रां	..	...	2	2
				116
क्ट्र	2	..	..	2
क्ल	..	..	2	2
क्व	1	4	..	5
क्विं	..	..	6	6
				11
क्श	1	..	..	1
क्स	5	..	2	7
ख्य	13	10	14	37
ख्ये	..	2	..	2
ख्यें	..	6	..	6
				45
ग्द	..	4	..	4
ग्ध	..	2	..	2
ग्न	3	..	..	3
ग्मी	1	..	..	1
				4
ग्य	23	12	4	39
ग्यं	..	...	1	1
				40

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
ग्र	4	10	6	20
ग्रा	9	4	12	25
ग्री	3	..	2	5
ग्रे	3	..	6	9
ग्रं	..	6	8	14
ग्रॅ	..	4	..	4
				77
ग्ल	...	2	..	2
ग्ले	...	...	2	2
				4
घ्र	..	..	6	6
ङ्म	...	..	2	2
च्च	5	...	..	5
च्चा	1	4	..	5
च्चि	1	...	..	1
च्चे	2	..	4	6
च्चा	1	...	..	1
				18
च्छ	5	..	10	15
च्छा	3	6	..	9
च्छि	..	2	..	2
च्छी	2	..	18	20
च्छे	3	..	2	5
				51
च्य	...	...	8	8
ज्ञ	1	4	..	5
ज्य	17	20	14	51
ज्व	1	..	...	1
ट्टी	5	..	..	5
ट्टे	1	...	..	1
				6

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
ठ्य	...	10	..	10
ठ्यो	1	..	..	1
				11
ड्र	1	..	..	1
ड्री	1	..	..	1
ढ्ढा	..	..	2	2
				3
ढ्ढे	...	...	2	2
ढ्री	...	...	2	2
ढ्ढ	1	..	4	5
ढ्ढे	...	..	2	2
				7
ण्य	2	4	8	14
त्क	...	2	..	2
त्का	1	..	2	3
				5
त्त	17	22	10	49
त्ता	3	8	20	31
त्ती	4	..	..	4
त्ते	1	..	..	1
त्तीं	1			1
				86
त्थ	...	2	..	2
त्न	14	6	12	32
त्ना	9	..	..	9
त्नी	..	2	..	2
त्नां	3	..	..	3
त्नों	..	..	2	2
				48

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
त्प	8	2	..	10
त्पा	11	2	6	19
त्पः	7	..	..	7
				36
त्म	..	4	..	4
त्मी	1	..	...	1
				5
त्य	22	10	10	42
त्यु	..	..	2	2
त्ये	21	26	12	59
त्यं	..	10	..	10
				113
त्स्य	2	...	..	2
त्स्या	1	..	..	1
				3
थ्य	5		..	5
थ्यो	1		..	1
थ्यं	...	4	...	4
				10
त्व	4	14	6	24
त्वा	22	20	..	42
त्वे	1	..	..	1
त्वों	..	..	4	4
				71
त्व	..	4	..	4
त्वा	...	4	...	4
				8

—	Bhasha Mandal	Marathi Newspaper	Hindi Newspaper	Total
त्स	..	6	...	6
त्सा	1	8	2	11
त्सु	..	2	..	2
				19
थ्य	..	..	2	2
द्धा	...	..	6	6
द्द	7	14	..	21
द्दा	1	4	..	5
द्दि	3	2	..	5
द्दी	2	..	2	4
द्दे, द्दें	1	..	..	1
	2	2	18	22
				58
द्ध	31	34	4	69
द्धा	10	..	..	10
द्धि	..	..	6	6
द्धी	1	2	..	3
द्धो	2	..	..	2
द्धां	..	..	2	2
				92
द्ध	...	...	2	2
द्म	1	...	...	1
द्य	5	14	2	21
द्यु	8	2	..	10
द्ये	1	..	...	1
द्यो	30	18	6	54
				86

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
द्र	12	204	80	296
द्रा	15	4	2	21
द्रि	4	2	8	14
द्री	1	6	..	7
द्रे	7	...	..	7
द्या	1	...	..	1
				346
द्वा	3	20	26	49
द्वि	1	..	..	1
				50
ध्य	22	22	24	68
ध्ये	38	12	2	52
ध्यें	..	2	..	2
				122
ध्व	1	10	2	13
न्ट	..	..	4	4
न्टी	..	..	2	2
				6
न्डी	...	2	2	4
न्त	1	..	16	17
न्ता	...	6	..	6
न्ति	..	4	4	8
न्तु	8	..	2	10
				41
न्थ	..	..	2	2
न्द	..	2	6	8
न्दी	..	36	18	54
				62
न्ध	...	16	..	16
न्धि	...	4	2	6
न्धी	..	2	2	4
				26

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
न्न	15	6	8	29
न्ना	...	2	2	4
				33
न्म	1	..	..	1
न्मा	5	..	..	5
				6
न्य	16	20	14	50
न्यू	1	..	2	3
न्ये	2	...	..	2
न्यो	1	..	..	1
				56
न्त्री	...	...	2	2
न्द्र	...	4	2	6
न्द्री	...	...	10	10
				16
न्ध्र	1	...	..	1
न्व	2	8	2	12
न्वि	1	..	..	1
				13
न्शि	1	...	..	1
न्स	12	6	..	18
न्सी	..	2	..	2
				20
न्ह	..	2	..	2
न्हा	4	..	4	8
न्ही	6	6	..	12
न्हे	6	..	..	6
न्हीं	..	6	..	6
न्हें	..	2	8	10
न्हौं	..	..	14	14
				58

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
प्त	1	..	28	29
प्ता	..	..	24	24
प्ति	..	..	8	8
प्ती	1	..	..	1
प्तीं	3	..	..	3
प्तें	1	..	..	1
				66
प्र	..	10	..	10
प्रे	1	..	..	1
				11
प्प	1	..	..	1
प्पा	5	..	..	5
प्पू	1	..	..	1
प्या	2	..	..	2
				9
प्र	233	242	186	661
प्रा	31	24	36	91
प्रि	2	2	..	4
प्रे	2	22	12	36
प्रो	1	10	2	13
प्रौ	1	..	..	1
प्रां	..	2	..	2
प्रिं	..	4	..	4
				812
प्लॉ	1	..	..	1
फ्ट	4	..	..	4
फ्ता	..	..	4	4
फ्रि	4	..	..	4
फ्री	..	..	4	4
				8

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
ब्जा	1	...	...	1
ब्द	1	2	..	3
ब्दि	..	..	2	2
ब्दो	..	2	..	2
ब्दां	3	..	..	3
ब्दों	..	..	2	2
				12
ब्ध	12	2	..	14
ब्बे	..	..	1	1
ब्यु	1	..	..	1
ब्र	..	2	2	4
ब्रि	1	..	..	1
ब्रु	1	..	..	1
				6
भ्सि	3	..	..	3
भ्न	..	..	26	26
भ्प	..	..	4	4
भ्पू	..	..	2	2
भ्पो	..	..	2	2
				8
भ्फी	..	...	2	2
भ्ब	..	..	34	34
भ्भा	..	..	2	2
भ्भो	..	..	2	2
				38
भ्भ	..	..	2	2
भ्भा	..	..	2	2
				4

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
म्मा	...	..	2	2
म्मि	...	..	2	2
म्मी	2	..	..	2
म्मे	..	..	30	30
				36
म्यु	..	..	2	2
म्र	..	2	..	2
म्स	1	..	..	1
म्ह	71	82	2	155
म्हा	7	6	..	13
म्ही	9	4	..	13
म्हे	1	..	..	1
				182
य्य	5	4	2	11
ल्हा	2	10	..	12
ल्हे	3	16	..	19
				31
ल्क	1	..	..	1
ल्कि	...	...	2	2
				3
ल्ट	1	..	..	1
ल्डी	..	..	2	2
ल्न	1	..	..	1
ल्प	9	6	12	27
ल्फे	1	..	..	1
ल्भ	..	..	2	2
ल्य	2	..	...	2
ल्ल	..	2	..	2
ल्ला	9	..	6	15
ल्ली	7	..	6	13
ल्ले	4	12	26	42
				72
ल्वा	14	..	..	14
ल्वु	2	..	..	2
				16
ल्स	...	2	..	2
व्हा	13	20	..	33
व्ही	1	..	..	1
व्हे	3	..	..	3
व्ह्या	19	..	..	19
व्ह्यां	8	4	..	12
				68
व्य	22	84	58	164
व्ये	1	..	..	1
				165
व्र	..	..	2	2
श्ह	4	6	..	10
श्हा	26	4	..	30
श्ही	..	4	..	4
श्हे	4	2	..	6
श्हां	..	4	..	4
				54
श्कि	..	..	2	2
श्च	3	2	6	11
श्चा	1	..	6	7
श्चि	13	4	16	33
				51
श्न	15	14	6	35
श्ना	4	..	..	4

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
श्नां	..	2	..	2
श्नो	..	..	2	2
				43
श्मी	5	..	4	9
श्य	26	14	50	90
श्यों	..	..	6	6
				96
श्व	3	2	..	5
श्वा	2	6	2	10
				15
ष्क	9	..	..	9
ष्का	2	2	..	4
ष्कृ	1	..	..	1
				14
ष्ट	25	30	18	73
ष्टा	1	..	..	1
ष्टिष्ट	2	12	..	14
ष्टी	10	36	..	46
ष्टीं	3	8	..	11
				145
ष्ठ	4	2	..	6
ष्ठा	..	2	8	10
ष्ठे	..	2	..	2
				18
ष्णा	4	..	..	4
ष्म	..	..	2	2
ष्य	1	4	4	9
ष्यें	..	2	..	2
ष्य्या	..	6	..	6
				17
ष्व्य	..	2	..	2
ष्य्य	..	4	..	4
ष्ट्र	8	40	30	78
ष्ट्रा	17	..	..	17
ष्ट्री	20	4	..	24
ष्ट्रे	1	..	..	1
ष्ट्रां	4	10	2	16
ष्ट्रों	..	..	2	2
				138
स्क	..	..	2	2
स्का	..	4	..	4
स्कृ	..	..	2	2
				8
स्ट	..	6	6	12
स्टा	..	2	2	4
स्टी	2	..	..	2
स्टे	4	2	..	6
स्टिं	..	2	..	2
स्टॉ	..	1	..	1
				27
स्त	14	30	8	52
स्ता	19	6	30	55
स्ति	6	4	..	10
स्ती	12	4	5	21
स्तु	5	14	6	25
स्तू	3	..	8	11
स्ते	2	..	..	2
स्तां	1	..	..	1
स्तें	7	..	..	7
स्तृ	1	2	..	3

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
त्या	16	..	..	16
त्यां	..	2	..	2
				205
त्र	17	...	26	43
त्रा	51	34	48	133
त्रि	26	26	52	104
त्री	13	..	..	13
त्रू	1	..	..	1
त्रे	6	8	..	14
त्रै	1	4	..	5
त्रां	5	..	..	5
त्रें	..	2	..	2
त्र्या	1	..	..	1
				321
त्ने	2	..	2	4
त्प	5	22	22	49
त्पू	..	2	..	2
				51
त्फु	1	..	..	1
त्फ़ु	1	2	..	3
त्फ़ां	1	...	..	1
				5
त्मा	2	..	..	2
त्मृ	..	6	..	6
				8
त्य	2	..	2	4
त्यों	..	..	6	6
				10

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
त्य	..	2	..	2
थ्य	1	..	2	3
द्र	1	..	..	1
द्री	..	..	6	6
द्रो	..	..	6	6
द्रॉ	..	2	..	2
				15
न्त्र	3	2	4	9
न्त्रि	2	...	..	2
न्त्री	5	2	..	7
				18
न्ला	..	..	4	4
न्लि	..	..	4	4
				8
न्व	34	46	28	108
न्वा	8	12	16	36
न्वी	9	6	6	21
				165
न्सा	..	..	2	2
न्सं	...	...	2	2
				4
ह्य	1	4	..	5
ळ्य	..	2	..	2
क्ष्मी	1	2	..	3
क्ष्य	..	..	2	2
र्क	1	2	..	3
र्क्स	..	4	..	4

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
गं	4	20	2	26
गां	7	2	2	11
गिं	4	..	..	4
गीं	2	..	4	6
गौं	..	..	4	4
				51
घं	3	..	4	7
चं	11	2	2	15
चीं	8	4	8	20
चें	4	4	..	8
				43
जं	17	8	4	29
जां	9	..	..	9
				38
टं	4	12	..	16
टां	..	4	..	4
टीं	..	2	..	2
				22
डं	3	2	..	5
डां	1	..	..	1
				6
र्ण	28	12	12	52
र्णा	2	..	..	2
				54
तं	2	6	10	18
तां	..	4	2	6
तिं	1	..	18	19
तीं	7	6	..	13
तें	1	..	...	1

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
तूं	..	4	..	4
त्यां	1	..	..	1
				62
थं	19	4	20	43
थां	19	4	..	23
थिं	9	20	10	39
थीं	2	4	..	6
				111
थ्यं	..	4	..	4
थ्यां	3	2	..	5
				9
दं	..	..	4	4
दों	..	8	4	12
दिं	1	..	..	1
दें, दैं	1	..	12	13
दों	..	2	..	2
	..	2	..	2
				34
द्रं	..	..	6	6
धं	1	..	18	19
धां	3	6	10	19
धें	1	..	..	1
धीं	..	2	..	2
ध्यां	1	..	..	1
				42
ध्रां	...	..	1	1
ध्यं	2	..	..	2
नं	1	..	2	3
निं	3	..	..	3
नों	1	..	..	1
				7
पों	..	4	..	4

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
फ्	5	2	6	13
फ्ं	1	14	..	15
फ्ँ	..	8	..	8
				36
फ्र्युं	..	..	8	8
ब्रो	..	..	4	4
ब्ं	1	2	...	3
				7
भ्ं	..	2	4	6
भ्ां	4	2	2	8
भ्ैं	..	2	..	2
भ्ं/भ्ँ	2	..	..	2
	1	..	..	1
भ्ाँ	..	4	..	4
				23
म्	2	4	6	12
म्ा	7	20	2	29
म्ै	3	6	..	9
				50
य्	46	26	42	114
य्ा	33	16	12	61
य्ं	17	18	..	35
				210

—	Bhasha Mandal	Marathi News-paper	Hindi News-paper	Total
र्ं	2	..	6	8
ल्ं	..	2	..	2
व्	42	56	12	110
व्ा	5	8	6	19
व्ी	15	12	16	43
व्ै	1	2	..	3
व्ो	1	2	..	3
व्ाँ	4	14	..	18
				196
व्ह्	1	...	...	1
श्	2	30	..	32
श्ी	..	12	..	12
श्ी	..	4	..	4
				48
ष्	1	4	8	13
ष्ा	16	14	2	32
ष्ि	23	..	4	27
ष्ी	9	6	..	15
ष्ाँ	..	2	..	2
ष्ीं	..	2	..	2
ष्ूं	..	4	..	4
ष््या	..	2	..	2
				97
स्	..	10	2	12
स््म	..	2	..	2

TABLE 72

TABLE OF FREQUENCIES OF DEVANAGARI AKSHARAS

Table 72. **Table of Frequencies of Devanagari Aksharas**

Consonants / Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
A. VOWELS	1525	1864	282	285	632	74	457	57	42	120	57	..	26	41	1
B. CONSONANTS WITH CENTRAL-BAR															
क	2857	1813	391	161	88	563	234	154	132	..	19	..	202	43	4
	29	16	4	..	..	..	19	..	..	..	..	..	1	..	..
फ	73	81	22	14	9	15	20	2	4	2	..	..	..	..	..
	13	1910	417	2	1	3	16	..	..	..	..	..	..	..	..
	2972	1906	421	177	98	581	289	156	136	2	19	..	203	43	4
C. CONSONANTS WITH SHORT-BAR AND NO-BAR															
ङ	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
छ	80	62	4	2	..	..	..	2	59	..	..	..	..	10	..
	2											2			
	15	9	2	20	..	..	5	..	..	..	..	..	..	..	..
ट	481	77	21	60	..	3	61	..	15	4	..	..	17	..	2
	124	9	14	55	..	2	7	..	1	..	..	..	2	2	11
ठ	119	63	32	194	2	..	52	..	4	..	..	..	6	..	12
	6	10	..	..	..	..	2	..	..	..	..	..	..	..	..
ड	325	79	8	69	2	57	112	..	41	..	..	..	9	..	..
	10	1	..	5	..	..	2	..	2	..	..	..	..	..	..
ढ	138	23	..	24	..	15	46	..	..	..	4	..	1	..	..
	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
ण	28 526	297	277	102	1054	57	381	39	53	3	19	.. 5	24	..	3
	40	17	8	60	..	1	35	2	4	..	..	..	3	..	..
त	3771	816	369	518	86	266	208	..	112	2	100	..	129	8	5
	1167	159	49	66	1	..	55	..	19	1	14	..	20	4	..
थ	626	479	405	476	105	27	712	368	531	..	4	..	29	18	118
	167	96	1	30	..	..	35	..	..	..	..	..	4	..	6
द	225	91	..	48	..	22	117	..	3	..	2	..	13	..	10
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	28 7822	2288	1190	1729	1250	450	1832	411	844	10	143	(7)	257	42	167
D. CONSONANTS WITH VERTI-BAR															
ह	280	185	18	42	13	16	59	5	21	..	16	..	10	2	..
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
न	1008	335	79	108	59	12	118	29	83	4	6	..	52	..	4
	26	11	4	6	..	..	..	..	..	..	..	..	..	..	..
ध	136	120	6	3	2	17	74	..	11	..	4	..	7	..	..
	7	6	..	..	..	..	..	..	..	..	..	..	..	..	..
ब	559	677	129	464	20	18	396	3	4	1	6	..	29	7	10
	32	32	34	..	..	..	14	..	..	..	..	..	..	..	..

उं	ऊं	एं	ऐं	ओं	औं	अॅ	आॅ	अॅं	आॅं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct	Total.
6	36	4	..	40	..	3	16	3	2	2	..	..	..	..	5575	..	5575
..	4	48	..	39	..	4	18	..	10	22	..	19	4	..	6829	..	7295
..	..	..	..	..	..	..	..	..	..	3	..	..	..	72	..	394	
..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	246	..	314
..	..	8	..	..	..	..	1	..	..	..	..	..	..	44	..	24	
..	4	56	..	39	..	6	21	..	10	25	..	19	4	116	7075	418	7609
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	223	..	272
..	..	..	..	..	..	..	..	..	..	..	..	..	..	51	..	..	
6	6	12	..	2	..	1	..	..	..	..	..	19	7	..	794	..	1195
..	..	..	..	..	..	..	..	..	1	..	..	..	..	228	..	173	
..	..	..	..	..	..	..	..	..	..	..	..	37	1	..	522	..	542
..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	..	2	
1	..	6	..	2	..	..	4	..	..	..	..	26	17	..	758	..	785
..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	..	7	
..	..	6	..	..	..	..	..	..	..	..	..	5	..	..	262	..	264
..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	
..	..	8	..	..	4	..	..	..	..	67	..	169	24	..	3140	..	3983
..	..	..	..	2	..	..	..	..	..	..	..	..	..	172	..	666	
..	16	26	..	52	..	..	..	..	..	..	..	159	28	..	6671	.. 33	8268
..	..	..	..	2	..	..	2	4	..	..	..	1	..	1564	*rafar*	1206	1206
8	18	24	64	9	..	..	..	..	4	10	..	100	5	..	4140	..	4539
..	..	10	..	..	14	..	..	..	..	..	..	19	12	394	..	5	
..	2	16	..	..	..	..	..	..	..	..	..	26	20	..	595	..	597
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	
15	42	108	64	69	18	1	6	4	5	77	..	560	114	2449	17105	890 1206	20447 1206
..	..	2	..	..	..	..	..	..	1	..	..	41	..	..	711	..	756
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	45	
3	..	2	..	8	..	..	..	..	..	22	..	3	..	..	1935	..	
..	..	..	..	4	..	..	..	..	..	..	..	..	..	51	..	131	2117
4	..	..	..	..	..	..	..	..	..	..	..	7	..	..	391	..	
..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	..	6	410
..	..	96	..	..	..	..	..	..	..	..	..	698	2	..	3119	..	
..	..	..	..	..	..	..	..	..	..	..	..	1	..	113	.	77	3309

Conjuncts	Halants ्	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	:	आं	इं	ईं
ङ		818	390	159	158	18	53	94	8	89	..	12	..	13	..	..
क्ष		34	10	..	..	..	..	..	..	..	..	..	..	..	..	..
ब्र		11	202	8	6	3	..	9	..	3	..	..	..	4	..	..
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
		..	..	..	..	..	..	..	..	.	..	..	..	..	..	..
ण		812	487	214	67	5	80	138	..	1	..	1	..	22	..	12
		52	6	..	..	..	..	..	..	..	..	..	..	..	..	..
त	12	2864	582	253	692	80	222	271	9	185	2	21	..	78	..	23
		83											(83)			
		254	127	80	60	35	13	6	..	..	..	..	..	1	..	4
थ		100	96	1	17	1	..	60	1	25	..	1	..	6	..	3
द		90	156	143	13	..	1	14	5	..	..	..	..	11	..	..
		216	186	193	78	19	17	10	..	21	..	87	..	3	..	2
		4											4			
		120	30	12	7	..	..	1	..	2	..	..	..	4	..	..
न	2	2024	1114	427	328	74	1	892	7	24	..	70	..	74	2	2
		11											11			
		139	17	3	3	..	..	5	..	3	..	..	..	5	..	..
ट		1646	561	31	23	273	195	52	53	24	2	58	..	16	..	..
		91	24	..	..	..	5	..	..	6	..	..	7	..	..	..
		7														
ठ		564	315	38	33	11	19	21	3	33	..	95	..	41	..	5
		36	6	..	..	..	..	1	..	2	..	3	..	..	..	..
भ		164	451	60	148	4	55	24	..	3	2	3	..	16	..	..
		11	10	2	..	2	..	1	..	..	..	..	..	4	..	..
म		1291	778	339	176	577	22	67	13	113	10	117	..	68	..	2
		23	38	11	15	..	..	30	..	..	..	..	..	..	..	..
य		762	783	25	73	46	8	393	..	232	..	43	..	185	..	4
		2											2			
		785	69	..	..	36	5	117	..	57	..	50	..	..	..	..
र		1485	923	157	367	10	56	639	2	99	2	15	..	31	11	2
		8	19	4	13	..	..	44	..	..	..	..	..	..	..	..
ल		1797	617	736	126	1	41	370	33	10	..	51	..	6	..	..
		282	174	2	64	2	..	4	..	3	..	..	..	18	6	..
श		441	276	223	163	11	5	143	2	12	1	9	..	5	13	4
		33	..	13	4	..	..	..	..	..	..	..	..	..	..	..
ष		95	6	5	..	..	..	2	..	4	..	2	..	3	..	..
		13	32	27	15	..	..	..	..	..	..	..	..	2	..	2
स	6	2217	792	61	56	189	160	374	7	73	6	384	..	41	12	..
		50	13	3	2	2	..	..	..	..	..	2	..	..	..	..
ह		258	59	20	7	1	..	86	2	..	..	..	..	7	..	..
		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ज्ञ		6	18	..	..	..	..	..	..	..	..	..	..	1	..	..
	20	21747	10733	3520	3337	1494	1021	4529	182	1143	30	1056	107	763	53	79

उं	ऊं	एं	ऐं	ओं	औं	अॅं	आॅं	अॅं	आॅं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct	Total
..	8	..	..	4	..	..	..	..	..	..	..	68	11	..	1903	..	2004
..	..	..	..	..	..	..	..	..	..	..	..	..	..	44	..	57	
2	..	..	..	..	..	..	..	..	..	..	..	6	..	..	254	..	254
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
..	..	36	..	..	..	..	..	..	..	..	..	429	63	..	2367	..	2446
..	..	..	..	..	..	..	..	..	..	..	..	..	..	58	..	21	
..	2	34	..	15	..	..	..	..	..	4	..	347	139	..	5918	..	7030
..	..	8	..	..	..	..	..	..	..	13	..	18	4	623	83	406	
..	..	18	..	2	..	..	..	..	..	..	..	1	..	..	332	..	782
..	..	2	..	..	..	..	..	..	..	..	..	1	..	436	..	14	
2	2	2	..	..	..	..	..	..	..	..	..	38	2	..	882	..	1200
..	..	..	..	..	..	..	..	..	..	..	..	..	..	176	4	138	
..	..	80	..	56	..	..	..	..	..	4	..	55	25	..	5272	..	5807
..	..	..	..	2	..	..	..	..	..	..	..	..	..	177	11	347	
..	2	3	..	2	..	1	2	..	..	7	..	..	..	..	2951	..	3992
..	..	..	..	..	..	..	..	..	..	..	..	2	..	135	..	899	
..	..	..	2	2	..	1	..	4	..	2	..	1	..	7	1190	..	1276
..	..	..	..	..	..	..	..	..	..	..	..	..	..	48	..	38	
..	..	3	..	4	..	..	..	..	..	2	..	18	..	..	957	..	987
..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	
29	..	408	2	12	..	..	..	..	..	9	..	1	..	..	4034	..	4458
..	..	..	..	..	..	..	..	..	..	6	..	..	..	123	..	301	
..	..	16	..	58	..	..	..	..	..	..	..	10	..	..	2640	..	3808
..	..	4	6	18	..	..	..	..	..	..	..	6	..	1153	..	15	
..	..	64	..	20	..	..	1	..	..	..	..	400	6	..	4290	..	4576
..	..	..	..	..	..	..	1	..	..	..	..	..	..	89	..	197	
..	14	20	..	30	..	..	..	..	..	29	..	98	5	..	3984	..	4765
..	..	..	..	4	..	..	..	..	..	..	..	..	..	559	..	222	
..	..	2	..	18	..	..	..	..	..	..	..	7	..	..	1335	..	1601
..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	..	216	
..	..	1	..	..	..	..	..	..	..	..	..	3	2	..	123	..	564
..	4	..	..	..	..	..	..	..	..	..	..	2	..	97	..	344	
6	..	36	..	8	8	..	..	..	..	4	..	13	7	..	4460	..	5391
..	..	..	..	..	..	..	..	..	..	..	..	..	..	72	..	859	
..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	442	..	447
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	
..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	29	..	29
46	32	837	10	271	8	2	4	4	1	102	..	2276	266	4054	49617	4338	58,009

H 5447–30

Conjuncts / Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	इ
E. CONSONANTS WITH NUKTA.															
ड़्	24	6	2	2	..	..	..	..	..	..	..	..	..	..	..
ढ़्	12	..	..	2	..	..	..	..	..	..	..	..	..	..	..
	36	6	2	4	..	..	..	..	..	..	..	..	..	..	..
F. SPECIAL COMPOUNDS.															
श्र	12	3	2	130	4	..	14	..	2	..	..	..	1	..	..
ज्ञ	157	56	18	37	..	7	7	..	..	..	..	..	34	..	..
	9	..	2	9	..	..	..	..	..	..	..	..	..	..	..
	178	59	22	176	4	7	21	..	2	..	..	..	35	..	..

Table 73. **Table of Frequencies of Conjuncts in Devanagari**

क	क्क्	12	5	..	..	..	..	19	..	..	..	..	..	1	..	..
	क्च्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	क्ट्	14	..	..	..	..	2	..	..	1	..	..	..	..	..	..
क्त	क्त्	89	1	35	21	..	2	2	..	..	..	..	..	..	..	..
	क्य्	16	..	..	..	13	2	..	..	..	..	..	..	..	..	..
क्र	क्र	75	5	24	8	..	..	2	..	..	..	..	..	2	..	..
क्ट्र	क्ट्र	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
	क्ल्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
क्व	क्व्	5	..	..	..	..	..	..	..	..	..	..	..	..	6	..
	क्श्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	क्स्	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	क्ष्य्	37	..	..	..	..	..	2	..	..	..	..	..	..	..	..
	ग्द्	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ग्ध्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ग्न	ग्न्	3	..	..	1	..	..	..	..	..	..	..	..	..	..	..
	ग्य्	39	..	..	..	..	..	..	..	..	..	1	..	..	..	..
ग्र	ग्र	20	25	..	5	..	..	9	..	..	..	14	..	..	..	..
ग्ल	ग्ल्	2	..	..	..	..	..	2	..	..	..	..	..	..	..	..
घ्र	घ्र्	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ङ्म	ङ्म्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
च्च	च्च्	5	5	1	..	..	..	6	..	..	..	..	..	..	..	..
	च्छ्	15	9	2	20	..	..	5	..	..	..	..	..	..	..	..
	च्य्	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ज्ञ	ज्ञ्	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ज्य्	51	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ज्व्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ट्ट्	..	..	..	5	..	..	1	..	..	..	..	..	..	..	..

उं	ऊं	एं	ऐं	ओं	औं	मॅं	मॉं	मॅं	मॉं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	48	..
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	169	..
..	..	4	..	16	..	..	..	..	..	..	..	4	4	..	344	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	..	10
	..	4	..	16	..	..	..	..	..	1	..	4	4	20	513	10
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	37	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17	..
..	..	..	..	..	..	..	..	..	..	6	..	1	2	..	159	..
..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	37	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	116	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..
..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	45	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	40	..
..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	77	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	18	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..

Conjuncts	Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
च्च	च्च	10	..	..	..	..	..	..	..	1	..	..	..	..	..	..
द्र	द्र	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ड्ड	ड्ड्	..	..	..	1	..	..	..	..	2	..	..	..	..	..	..
ड्ढ	ड्ढ्	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
ड्र	ड्र्	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
ण्ड	ण्ड्	5	..	..	..	..	..	2	..	..	..	..	..	..	..	..
	ण्य्	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	त्क्	2	3	..	..	..	..	..	..	..	..	..	..	..	..	..
त	त्त्	49	31	..	4	..	..	1	..	..	..	..	..	..	..	1
	त्थ्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
न	त्न्	32	9	..	2	..	..	..	..	..	..	..	..	3	..	..
	त्प्	10 7	19	..	..	..	..	..	..	..	..	..	7	..	..	..
	त्म्	4	..	..	1	..	..	..	..	..	..	..	..	..	..	..
त्य	त्य्	42	..	..	..	2	..	59	..	..	..	10	..	..	..	..
	त्स्य्	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..
त्र्य	त्र्य	5	..	..	..	..	..	..	..	1	..	4	..	..	..	..
	त्व्	24	42	..	..	..	..	1	..	..	..	..	..	..	..	..
त्व	त्व्	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..
	त्स्	6	11	..	..	2	..	..	..	..	..	..	..	..	..	..
	थ्य्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
द्घ	द्घ्	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..
द्द	द्द्	21	5	5	4	..	1	22	..	..	..	..	..	..	..	..
द्ध	द्ध्	69	10	6	3	..	..	..	..	2	..	..	..	2	..	..
द्ब	द्ब्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
द्भ	द्भ्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
द्य	द्य्	21	..	..	..	10	..	1	..	54	..	..	..	..	..	..
द्र	द्र	296	21	14	7	..	..	7	..	..	..	..	..	..	..	..
द्व	द्व	..	49	1	..	..	..	..	..	..	..	..	..	..	..	..
	ध्य्	68	..	..	..	..	..	52	..	..	..	..	..	..	..	..
	ध्व्	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..
न्ट	न्ट्	4	..	..	2	..	..	..	..	..	..	..	..	..	..	..
ण्ड	न्ड्	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..
न्त	न्त्	17	6	8	..	10	..	..	..	..	..	..	..	..	..	..
न्थ	न्थ्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
न्द	न्द्	8	..	..	54	..	..	..	..	..	..	..	..	..	..	..
न्ध	न्ध्	16	..	6	4	..	..	..	..	..	..	..	..	..	..	..

उं	ऊं	एं	ऐं	ओं	औं	अॅ	आॅ	अॅं	आॅं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	86	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	48	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	113	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	..
..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	71	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	19	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	58	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	92	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	86	..
..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	346	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	..
..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	122	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	62	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	26	..

Conjuncts / Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
न्न्	29	4	...	...	...	...	...	...	...	...	...	...	...	...	...
न्म्	1	5	...	...	...	...	...	...	...	...	...	...	...	...	..
न्य्	50	...	...	...	...	3	2	...	1	...	...	...	..	..	..
न्त्र न्त्र्	...	...	...	2	...	...	...	...	...	...	...	...	..	..	..
न्द्र न्द्र्	6	...	...	10	...	...	...	...	...	...	...	...	..	..	..
न्ध्र न्ध्र्	1	...	...	...	...	...	...	...	...	...	...	...	..	..	..
न्व्	12	...	1	...	...	...	...	...	...	...	...	...	...	...	..
न्श्	...	...	1	...	...	...	...	...	...	...	...	...	...	..	...
न्स्	18	...	...	2	...	...	...	...	...	...	...	...	...	...	...
न्ह्ने	2	8	...	12	...	...	6	...	...	...	...	...	...	...	6
प्त	29	24	8	1	...	...	...	...	...	...	...	...	...	...	3
प्न प्न	10	...	...	...	...	...	1	...	...	...	...	...	...	...	...
प्प्	1	5	...	...	...	1	...	...	...	...	...	...	...	...	...
प्र प्र	661	91	4	...	...	...	36	...	13	1	...	...	2	4	..
प्ल प्ल	...	...	...	...	...	...	...	...	...	...	...	...	...	..	..
फ्ट्	4	...	...	...	...	...	...	...	...	...	...	...	...	...	..
फ्त्	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...
फ्र फ्र	...	...	4	4	...	...	...	...	...	...	...	...	..	...	...
ब्ज	...	1	...	...	...	...	...	...	...	...	...	...	...	...	..
ब्द्	3	...	2	...	...	...	...	...	2	...	...	...	3	...	...
ब्ध्	14	...	...	...	...	...	...	...	...	...	...	...	...	..	..
ब्ब्	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
ब्य्	...	...	...	...	1	...	...	...	...	...	...	...	..	...	..
ब्र ब्र	4	...	1	...	1	...	...	...	...	...	...	...	...	..	...
ब्स्	...	...	3	...	...	...	...	...	...	...	...	...	...	..	...
भ्न भ्न	26	...	...	...	...	...	...	...	...	...	...	...	...	..	...
भ्प	4	...	...	...	...	2	...	...	2	...	...	...	..	..	..
भ्फ्	...	...	...	2	...	...	...	...	...	...	...	...	..	..	..
भ्ब्	34	2	...	...	...	...	...	...	2	...	...	...	...	...	..
भ्भ्	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...
भ्म्	...	2	2	2	...	...	30	...	...	...	...	...	...	...	..
भ्य्	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...
म्र म्र	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
म्स्	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ह्म ह्म्	155	13	...	13	...	...	...	1	...	...	...	...	...	...	..
य्य्	11	...	...	...	...	...	...	...	...	...	...	...	...	...	..
ह्न	...	12	...	...	...	...	19	...	...	...	...	...	...	...	...

ऊं	ऊं	एं	ऐं	ओं	औं	अॅ	आॅ	अॅं	आॅं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	33	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	56	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	..
..	..	10	..	..	14	..	..	..	..	..	..	..	..	..	58	..
..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	66	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..
..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	9	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	812	..
..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	12	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	26	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	38	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	182	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	..

Conjuncs	Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
क्ल	ल्क्	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..
	ल्ट्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ल्द्	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
	ल्न्	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ल्प्	27	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ल्फ्	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
	ल्भ्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ल्य	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ल्ल	ल्ल्	2	15	..	13	..	..	42	..	..	..	..	..	..	..	..
	ल्व्	..	14	..	..	2	..	..	..	..	..	..	..	..	..	..
	ल्स्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ल्ह्	..	33	..	1	..	..	3	..	..	..	..	..	..	..	..
	व्य्	164	..	..	..	..	..	1	..	..	..	..	..	..	..	..
व्र	व्र	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	व्ह्	10	30	..	4	..	..	6	..	..	..	..	..	4	..	..
	श्क्	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
श्च	श्च्	11	7	33	..	..	..	..	..	..	..	..	..	..	..	..
श्न	श्न्	35	4	..	..	..	..	..	..	..	..	..	..	2	..	..
श्म्	श्म्	..	..	..	9	..	..	..	..	..	..	..	..	..	..	..
	श्य	90	..	..	..	..	..	..	..	..	..	..	..	..	..	..
श्व	श्व्	5	10	..	..	..	..	..	..	..	..	..	..	..	..	..
	ष्क्	9	4	..	..	..	..	..	..	..	..	..	..	..	..	..
ष्ट	ष्ट	73	1	14	46	..	..	..	..	..	..	..	..	..	..	11
ष्ठ	ष्ठ	6	10	..	..	..	..	2	..	..	..	..	..	..	..	..
	ष्ण्	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..
	ष्म्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ष्य्	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ष्ठ्य	ष्ठ्य्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	ष्य्य्	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ष्ट्र	ष्ट्र्	78	17	..	24	..	..	1	..	..	..	..	..	16	..	..
	स्क्	2	4	..	..	..	..	..	..	..	..	..	..	..	..	..
	स्ट्	12	4	..	2	..	..	6	..	..	..	..	..	..	2	..
	स्त्	52	55	10	21	25	11	2	..	..	..	..	..	1	..	..
	स्थ्	43	133	104	13	..	1	14	5	..	..	..	..	5	..	..
स्न	स्न्	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..
	स्प्	49	..	..	..	..	2	..	..	..	..	..	..	..	..	..
	स्म्	..	..	..	..	1	3	..	..	..	..	..	..	..	..	..

उं	ऊं	एं	ऐं	ओं	औं	अँ	आँ	अँ	आँ	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	72	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	19	12	..	68	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	165	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	54	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51	..
..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	43	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	..
..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	96	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	..
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	14	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	145	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	2	..	..	..	..	..	..	..	..	..	6	..	..	17	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	138	..
..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	27	..
..	..	7	..	..	..	..	..	..	..	3	..	16	2	..	205	..
..	..	2	..	..	..	..	..	..	..	..	..	1	..	..	321	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51	..
..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	5	..

Conjuncts Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
स्म्	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
स्य्	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
स्त्य्	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
स्थ्य्	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
स्त्र स्ट्र्	1	..	..	6	..	..	..	..	6	..	..	..	..	..	..
स्त्र स्त्र्	9	..	2	7	..	..	..	..	..	..	..	..	..	..	..
स्ल्	..	4	4	..	..	..	..	..	..	..	..	..	..	..	..
स्व्	108	36	..	21	..	..	..	..	..	..	..	..	..	..	..
स्स्	..	2	..	..	..	..	..	..	..	..	2	..	..	..	..
ह्य ह्च	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ळ्य	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
क्ष्म	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
क्ष्य	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..

RAFARI CONJUNCTS

र्क	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
र्क्स	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
र्ग, र्ग्, र्घ	26	11	4	6	..	..	..	..	..	..	..	..	..	..	..
र्घ	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..
र्च, र्च्, र्छ	15	20	..	..	..	..	8	..	..	..	..	..	..	..	..
र्ज, र्ज्, र्झ	29	9	..	..	..	..	..	..	..	..	..	..	..	..	..
र्ट, र्ट्, र्ठ	16	4	..	..	..	..	..	..	..	..	..	..	2	..	..
र्ड, र्ड्, र्ढ	5	1	..	..	..	..	..	..	..	..	..	..	..	..	..
र्त, र्त्, र्न, र्न्, र्थ	52	2	..	..	..	..	..	..	..	..	..	..	..	..	..
र्थ, र्त्र, र्त्र्, र्द	18	6	19	13	..	..	1	..	..	..	..	..	..	..	..
र्थ	43	23	39	..	..	..	..	..	..	..	..	..	6	..	..
र्थ्य	4	5	..	..	..	..	..	..	..	..	..	..	..	..	..
र्द, र्द्, र्ध	4	12	1	..	..	..	13	2	2	..	..	..	..	..	..
र्ध, र्ध्, र्ध्र	6	..	..	..	..	.	..	..	..	..	..	..	..	..	..
र्ध, र्ध्, र्ध्र	19	19	..	..	..	..	1	..	..	..	..	..	2	..	..
र्ध्य		1	..	..	..	..	..	..	..	..	..	..	..	..	..
र्न, र्न्, र्न्य	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
र्प, र्प्, र्फ	3	..	3	..	..	..	..	..	1	..	..	..	..	..	..
र्फ, र्फ्, र्प्य	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..
र्ब, र्ब्, र्भ, र्भ्, र्म, र्म्, र्म्य	13	..	..	..	..	..	15	..	..	..	..	..	..	..	..
र्य, र्य्, र्व, र्व्, र्व्य	..	..	..	..	8	..	..	..	..	..	..	..	..	..	..
र्ब, र्ब्, र्ब्य	..	4	..	..	..	..	..	..	..	..	3	..	..	..	..

उं	ऊं	एं	ऐं	ओं	औं	अॅ	अॉ	अॅं	अॉं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	8	..
..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	10	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	15	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	165	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	51	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	43	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	38	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	22	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	54	..
..	..	..	..	..	..	..	..	..	..	4	..	1	..	..	62	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	111	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..
..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	42	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	7	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..
..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	36	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..

Conjunct Halants	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	आं	इं	ईं
भ, भ	6	8	2	..	2	..	1	..	..	..	..	..	4	..	..
म, म	12	29	9	..	..	..	..	..	..	..	..	..	..	..	..
य, य	114	61	..	..	..	..	..	..	..	..	35	..	..	..	..
र, र	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ल, ल	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
व, व	110	19	..	43	..	..	3	..	3	..	..	..	18	..	..
श, श/ह, ह	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
ष, ष	32	..	12	4	..	..	..	..	..	..	..	..	..	..	..
स, स	13	32	27	15	..	..	..	..	..	..	..	..	2	..	2
क्ष, क्ष	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..
स्म, स्म	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	3666	1076	439	451	77	30	414	8	97	1	69	7	75	12	23
TOTALS OF TABLES 72 A TO F															
A	1525	1864	282	285	632	74	457	57	42	120	57	..	26	41	1
B	2972	1906	421	177	98	581	289	156	136	2	19	..	203	43	4
C 28	7822	2288	1190	1729	1250	450	1832	411	844	10	143	(7)	257	42	167
D 20	21747	10733	3520	3337	1494	1021	4529	182	1143	30	1056	107	763	53	79
E	36	6	2	4	..	..	..	..	..	..	..	..	..	..	..
F	178	59	22	176	4	7	21	..	2	..	..	..	35	..	..
48	34171	16858	5437	5708	2533	2133	7128	806	2167	162	1275	114	1284	179	251

उं	ऊं	एं	ऐं	ओं	औं	अॅ	आॅ	अॅं	आॅं	ऋ	ऌ	या	यां	Total: Last member in conjunct	Total: Full letters	Total: First member in conjunct
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	23	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	210	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	196	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	48	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	97	..
..	4	..	..	..	..	..	..	..	..	..	..	2	..	..	12	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	.
..	4	32	6	34	14	..	4	4	..	23	..	50	16	..	6632	..
6	36	4	..	40	..	3	16	3	2	2	..	..	..	..	5575	..
..	4	56	..	39	..	6	21	..	10	25	..	19	4	116	7075	418
15	42	108	64	69	18	1	6	4	5	77	..	561	114	2449	17105	890
46	32	843	10	271	8	2	4	4	1	102	..	2276	266	4054	49617	1206 4338
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	48	..
..	..	4	..	16	..	..	..	..	..	1	..	4	4	20	513	10
69	..	1009	74	435	26	12	47	11	18	207	..	2858	388	6639	79933	6852

Table 74. **Frequencies of Linotype matrices in Vijapure System**

Serial No.		*Matrix No.*	*Percentage*	*Cumulative Percentage*	*Serial No.*		*Matrix No.*	*Percentage*	*Cumulative Percentage*
1	ा	1	16·431	16·431	38	ै	48	·491	88·631
2	ि	4	8·134	24·565	39	्ले	411	·485	89·116
3	्	7	5·763	30·328	40	क	35-S	·477	89·593
4	र	27	3·928	34·256	41	्रे	56	·422	90·015
5	ी	V63	3·385	37·641	42	प	66	·399	90·414
6	ं	54	3·394	41·035	43	ख	60-S	·357	90·771
7	त	22	3·376	44·411	44	ड	76	·350	91·121
8	स	28	3·202	47·613	45	्रे	415	·348	91·469
9	व	380	3·044	50·657	46	ब	36	·348	91·817
10	ि	V93a	2·833	53·490	47	ो	397	·346	92·163
11	म	16	2·537	56·027	48	ख	78	·325	92·488
12	न	18	2·325	58·352	49	्ल	402	·321	92·809
13	ि	V94a	2·106	60·458	50	्व	384	·302	93·111
14	ल	42	1·956	62·414	51	्व	410	·298	93·409
15	कु	13	1·913	64·327	52	्	40R	·269	93·678
16	म	29	1·908	66·235	53	्रे	62	·261	93·939
17	द	17	1·878	68·113	54	ब	65	·259	94·198
18	ं	11	1·822	69·935	55	्र	409	·252	94·450
19	ि	5	1·781	71·716	56	ख	81a	·247	94·697
20	ह	33	1·533	73·249	57	्ये	72/V99	·246	94·943
21	ब	12	1·364	74·613	58	ः	V97	·235	95·178
22	ा	14	1·206	75·821	59	्व	418	·230	95·408
23	द	39	1·193	77·014	60	्ये	413	·230	95·638
24	प	25	1·067	78·079	61	्	26	·219	95·857
25	्वे	412	1·028	79·107	62	्रे	401	·207	96·064
26	्	V95	1·013	80·120	63	ः	43	·198	96·262
27	र	24	1·011	81·131	64	ख	V52	·188	96·450
28	क	30	·929	82·060	65	ट	105	·182	96·632
29	्ले	V44a	·879	82·939	66	्क	82	·181	96·813
30	्	51	·815	83·754	67	ब	83	·176	96·989
31	्	405	·748	84·502	68	ॉ	425	·167	97·156
32	ो	373	·723	85·225	69	्	34	·163	97·319
33	क	23	·641	85·866	70	्ॉ	426	·154	97·473
34	श	419	·624	86·490	71	्रे	399	·139	97·612
35	ट	63	·584	87·074	72	छ	V107	·134	97·746
36	्	57R	·537	87·611	73	्	101	·127	97·873
37	ब	64S	·529	88·140	74	्ख	L67a	·126	97·999

Serial No.		*Matrix No.*	*Percentage*	*Cumulative Percentage*	*Serial No.*		*Matrix No.*	*Percentage*	*Cumulative Percentage*
75	ै	395	·126	98·125	113	्र	385	·010	99·932
76	ख	73	·112	98·237	114	्ल्ये	400	·009	99·941
77	्ये	404	·110	98·347	115	्	52	·008	99·949
78	ट	V96	·107	98·454	116	्	67	·007	99·956
79	ध	381	·106	98·560	117	्	447	·007	99·963
80	ी	386	·100	98 660	118	्	383	·005	99·968
81	्रे	406	·092	98·752	119	्	431	·005	99·973
82	्रे	403	·075	98·827	120		214	·004	99·977
83	ी	275	·071	98·898	121	्	439	·004	99·981
84	्ख	300	·068	98·966	122	्	452	·004	99·985
85	्	2	·068	99 034	123	्	391	·003	99·988
86	्	390	·061	99·095	124	्	V98	·002	99·990
87	्ये	416	·058	99·153	125	ॐ	204	·002	99·992
88	्	109	·054	99·207	126	्	434	·002	99·994
89	्	299	·050	99·257	127	्	436	·002	99·996
90	्	408	·047	99·304	128	्	440	·002	99·998
91	ख	382	·047	99·351	129	्	420	·001	99·999
92	्वे	394	·046	99·397	130	्	217	·001	100·00
93	ल	110	·046	99·443	131	्	417		
94	्	435	·044	99·487	132	ॐ	223		
95	्	396	·043	99·530	133	्	377		
96	्	19	·041	99·571	134	्	259		
97	्	224	·038	99·609	135	्	433		
98	्	407	·037	99·646	136	्	249		
99	्	387	·031	99·677	137	्	392		
100	्	324	·030	99·707	138	्	V109		
101	्	243	·029	99·736	139	्	V110		
102	्	453	·027	99·763	140	्	389		
103	्	49	·025	99·780	141	्	448		
104	्	58	·022	99·810	142	्	430		
105	्	81	·018	99·828	143	्	449		
106	्	451	·017	99·845	144	्	443		
107	्	88	·015	99·860	145	्	445		
108	्	55R	·015	99·875	146	्	432		
109	्	388	·013	99·888	147	्	444		
110	्	414	·012	99·900	148	्	446		
111	्	V108	·011	99·911	149	्	107		
112	्	124	·011	99·922	150	्	V106		

Serial No.		Matrix No.	Percentage	Cumulative Percentage
151	ॢ	75		
152	ॣ	254		
153	ऩ	89		
154	ऱ	90		
155	ऴ	122		
156	ऺ	86		
157	ऻ	80		
158	़	116		
159	ऽ	102		
160	ॽ	113		
161	ः	68		
162	१	91		
163	२	92		
164	३	93		
165	४	94		
166	५ ५	95		
167	६	96		
168	७	97		
169	८ ८	98		

Serial No.		Matrix No.	Percentage	Cumulative Percentage
170	९	99		
171	0	100		
172	thin sp.	32		
173	en sp.	38		
174	em sp.	44		
175	,	45		
176	.	46*a*		
177	1	46		
178	?	114		
179	!	121		
180	hyphen	84		
181	;	102		
182	:	103		
183	’	v102		
184	(	301		
185	)	302		
186	/	370		
187	*	280		
188	ऽ	253		

Table 75. **Frequency of *Ukāri* Letters for Monotype setting.**

Serial No. in table 74	Ch.	Total Frequency	Frequency of the *Ukari* letters			
			Ch.	Fre.	Ch.	Fre.
4	र	3·928	रु	·043 ··	रू	·133 ·008
20	ह	1·533	हु	·050 ·004	हू	·014 ·025
23	द	1·193	दु	·527 ··	दू	·029 ··
35	ट	·584	टु	·003 ··	टू	·003 ·003
44	ड	·350	डु	·001 ·001	डू	·028 ··
56	ळ	·247	ळु	·· ··	ळू	·· ··
64	ठ	·188	ठु	·· ·001	ठू	·011 ·001
76	ढ	·112	ढु	·· ··	ढू	·007 ··
105	ऌ	·018	ऌु	·· ··	ऌू	·· ··
116	ढ़	·007	ढ़ु	·· ··	ढ़ू	·· ··
72	छ	·134	छु	·· ··	छू	·· ··
7	त	3·376	तु	·060 ··	तू	·118 ·001
8	थ	3·202	थु	·041 ··	थू	·007 ··
11	स	2·537	सु	·096 ··	सू	·080 ··
12	न	2·325	नु	·037 ··	नू	·001 ··
14	ल	1·956	लु	·005 ··	लू	·008 ··
16	म	1·908	मु	·289 ·015	मू	·011 ··
21	च	1·364	चु	·· ··	चू	·· ··

Serial No. in table 74	Ch.	Total Frequency	Frequency of the *Ukari* letters			
			Ch.	Fre.	Ch.	Fre.
24	ण	1·067	णु	·003 ··	णू	·040 ··
27	ग	1·011	गु	·030 ·002	गू	·006 ··
28	ज	·929	जु	·009 ··	जू	·026 004
33	ब	·641	बु	·006 ··	बू	·010 ··
34	श	·624	शु	·066 ··	शू	·003 ··
37	ध	·529	धु	·010 ·001	धू	·009 ·001
40	फ	·477	फु	·003 ··	फू	·028 ··
43	ख	·357	खु	·007 ··	खू	·008 ··
46	थ	·348	थु	·001 ··	थू	·001 ··
54	ष	·259	षु	·· ··	षू	·· ··
66	क्ष	·176	क्षु	·001 ··	क्षू	·· ··
67	घ	·176	घु	·001 ·002	घू	·009 ··
74	झ	·126	झु	.002 ·001	झू	·· ··
107	ञ	·015	ञु	··	ञू	··

Notes—

1. The second figure under frequency of thin letters represents the *ukāri* letters with *Anuswār*.
2. The letters कु कू वु वू फु and फू are not included here as they are provided in the Vijapure Scheme. Replacement of उ and ऊ with भु and भू does not affect the frequency.

PART FIVE

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APPENDIX A

NOTES ON THE WORK OF SCRIPT REFORMERS

1. Ramchandra Bhikaji Gunjikar (1874)*

The credit of initiating discussion on the necessity of changes in the Devanagari script goes to the philologist, late Ramchandra Bhikaji Gunjikar (1843-1901). He published an article on '*Shorthand for Marathi*' as far back as 1870.[1] His article on '*Ancient Indian Script*' was published in 1871.[2] The charts of the comparative study of the Brahmi and Devanagari graphemes prepared by him are reproduced elsewhere in this book Gunjikar published his book on '*Shorthand Script for Marathi*' in 1874.[3] In this small book Gunjikar included an appendix discussing the Devanagari script, which is summarised below:—

(*a*) The Devanagari script is required to be set in three steps which is laborious.

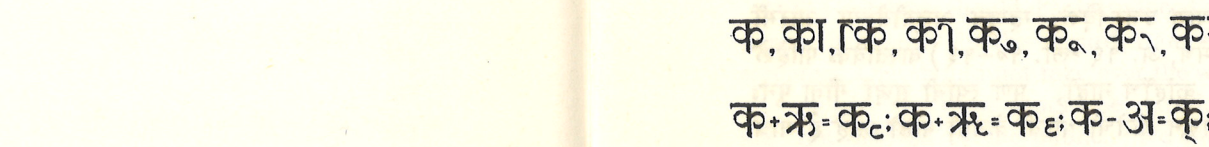
(*b*) The scriptures were being printed in Europe in Roman script and it had become necessary to learn the Roman script to read our own sacred books.

Gunjikar suggested the following changes in the Devanagari script:—

(1) The consonants, conjuncts, verti-bars and *visarga* may be written in the conventional style.

(2) The *repha* on the letters and short *i* vowel sign (*velānti*) may be written on the left instead of on the top.

(3) The *mātrā*, *anuswār*, long *velānti*, *ukār*, *Ṛ-kār* and the *halant* sign may be written on the right



Gunjikar recommends provision for indicating long vowel-signs as in *modi* to facilitate transcription of news reports, etc. His specific suggestion is that of adding a loop to the *velānti*, *ukār* and the end of *kānā*.

* The figures in brackets represent the date when the suggestions first appeared, as ascertained from the references.

2. Lokmanya Bal Gangadhar Tilak (1904)

The late Lokmanya Tilak as the founder and editor of *Kesari*, had to think on better production facilities for the growing circulation of the premier Marathi newspaper, which was founded in the year 1881. The subscribers had increased to about 5,000 by 1888. Since the type had to be renewed very often, owing to the large circulation, the necessity of installing

(सन १९१४ मध्यें सुधारून केलेला टिळक टाइपाचा मजकूर)

श्रीमद्भगवद्गीता हा आमच्या धर्मग्रंथांपैकीं एक अत्यंत तेजस्वी व निर्मल हिरा आहे. पिंडब्रम्हांडज्ञानपूर्वक आत्मविद्येचीं गूढ व पवित्र तत्त्वें थोडक्यांत पण असंदिग्ध रीतीनें सांगून त्यांच्या आधारें मनुष्यमात्रास आपल्या आध्यात्मिक पूर्णावस्थेची म्हणजे परम पुरुषार्थाची ओळख करून देणारा, आणि त्याबरोबरच भक्तीची ज्ञानाशीं व अखेर या दोहोंचीहि शास्त्रतः प्राप्त होणाऱ्या व्यवहाराशीं सोपपत्तिक व सुंदर जोड घालून संसारांत भांबावून गेलेल्या मनास शांत आणि विशेषतः निष्काम कर्तव्याचरणास प्रवृत्त करणारा, यासारखा दुसरा बालबोध ग्रंथ संस्कृतांतच काय पण जगांतील इतर वाङ्मयांतहि सांपडणें दुर्मिळ होय. केवळ काव्य या दृष्टीनें जरी याचें परीक्षण केलें, तरी आत्मज्ञानाचे अनेक गहन सिद्धान्त प्रासादिक भाषेनें आबालवृद्धांस सुगम करणारा आणि ज्ञानयुक्त भक्तिरसानें भरलेला हा ग्रंथ उत्तम काव्यांत गणिला जाईल. मग सकल वैदिक धर्माचें सार श्रीभगवंतांचे वाणीनें ज्यांत सांठविलें गेलें त्याची योग्यता काय वर्णावी! भारतीय युद्ध समाप्त होऊन कृष्ण व अर्जुन प्रेमानें गोष्टी बोलत बसले असतां श्रीभगवंतांचे मुखानें गीता पुनः ऐकण्याच्या इच्छेनें अर्जुनानें एक दिवस श्रीकृष्णांस अशी विनंति केली कीं, "युद्धारंभीं तुम्हीं केलेला उपदेश मी विसरलों; मला तो कृपा करून फिरून सांगा." तेव्हां, "सदर उपदेश त्या प्रसंगीं अत्यंत योगयुक्त चित्तानें केला असल्यामुळें तो पुनः तसाच सांगणें मलाहि अशक्य आहे!" असें भगवंतांनीं त्यास उत्तर दिलें, म्हणून अनुगीतेच्या आरंभीं म्हटलें आहे (म. भा. अश्वमेध, अ. १६ श्लो. १०–१३) वास्तविक पाहिलें तर, भगवंतांस अशक्य असें कांहींच नाहीं, पण त्यांनीं सुद्धां गीता पुनः सांगणें अशक्य म्हणावें, यावरून गीतेची थोरवी केवढी मोठी आहे हें मात्र चांगलें व्यक्त होतें. वैदिकधर्मांतील भिन्नभिन्न संप्रदायांस वेदाप्रमाणें हा ग्रंथ आज सुमारें अडीचहजार वर्षें,–सर्वांस एकसारखाच–मान्य व प्रमाणभूत होऊन बसला आहे, यांतील बीजहि हेंच असून, याच कारणास्तव—

Fig. 141. **Specimen of Tilak type as improved in 1914.**

a type-foundry within the press was felt. Sahadevrao Pimple, a punch-cutter, was engaged in the Arya Bhooshan Press where the weekly *Kesari* was being printed. With his assistance a smaller type was introduced in 1891. This type is known as pica of Ganpat Krishnaji, as it was cast from the matrices obtained from Ganpat Krishnaji of Bombay. It is also known as '*Kesari* pica type'. The Arya Bhooshan Press was later transferred to Vasudevrao Kelkar and Haripant Gokhale, and the *Kesari* office was shifted to the Gaikwadwada in Poona in 1905. Lokmanya Tilak then installed his own type-foundry and purchased matrices in Great Primer, Jabra, One-nick, Three Line Pica, etc. Lokmanya Tilak also obtained matrices of Nirnaya-sagar Pica, struck from the punches engraved by Ranoji Ravaji Aru. The pica type of Ganpat Krishnaji and that of Nirnaya-sagar was in use in *Kesari*. Tilak's attention was later drawn to the Linotype and Monotype machines and he started thinking on adaptation of the Devanagari script to the mechanical composition. In his attempts towards this end, he got punches of half letters made from Sahadevrao Pimple. This type was first introduced in the *Kesari* in 1904. Tilak also got new matrices made according to his system from Ranoji Aru of Nirnaya-sagar. Later the fount was again improved upon under his own guidance in 1914. The types cast by the late Lokmanya Tilak were taken by him to England where he is reported to have got new types cast in the Monotype factory. The Lokmanya, however, did not succeed in getting his system adapted then, either to Monotype or to Linotype. Later in 1926 N. C. Kelkar, the then Editor of *Kesari*, improved upon this fount, with the assistance of Narayanarao Pimple, son of Sahadevrao Pimple, the original punch-maker of the Kesari type-foundry. Pandit Dattatrey Krishna Deodhar, an artist, sculptor, engraver and the proprietor of Co-operative Industrial School, Sangli, has written a note on the script reforms of the late Lokmanya Tilak. He quotes the Lokmanya as under :[4]

> "The reforms should be introduced slowly, so that they may not annoy the reader. In this regard, I am willing to be classed as a conservative. One should not take over the whole responsibility of reforms on oneself. Reforms should be introduced in stages so that they are not disliked by the public. We must always leave some scope to the next generation to improve. There then will not be too much responsibility on us and the ultimate aim will be achieved without encountering difficulties. *We should not lag behind or run ahead too much.* My suggestions about the reforms in Devanagari type design are based on these principles."

Table 76. **Table of Sorts—Tilak's linear Devanagari.**

	1904	1914	1926
Vowels	10	5	5
Half consonants with verti-bar			
	24	23	23
Half consonants with small-bar	10	10	10
Conjuncts of half letters			
	28	31	31
Conjuncts of small-bar letters			
	22	18	19
Ukār letters	13	12	12
Mātrā letters, verti-bar removed	23		
Mātrā letters (short-bar)	9		
Letter for क, फ and ल	15	15	20
Mātrās for letters with verti-bar	16	18	18
Rafari mātrās for letters with verti-bar	6	10	10
Mātrās for use with letters with small-bar	13	15	17
Figures and Signs	10	10	10
	14	14	14
Total	213	181	189

(सन १९२६ मध्यें सुधारून केलेला टिळक टाइपाचा मजकूर)

श्रीमद्भगवद्गीता हा आमच्या धर्मग्रंथांपैकीं एक अत्यंत तेजस्वी व निर्मल हिरा आहे ब्रह्मविद्यांतर्गत आत्मविद्येचीं गूढ व पवित्र तत्त्वें थोडक्यांत पण असंदिग्ध रीतीनें सांगून त्यांच्या आधारें मनुष्यमात्रास आपल्या आध्यात्मिक पूर्णावस्थेची म्हणजे परम पुरुषार्थाची ओळख करून देणारा, आणि त्याबरोबरच भक्तीची ज्ञानार्थी व अखेर या दोहोंचीहि शास्त्रतः प्राप्त होणाऱ्या व्यवहारांशीं सोपपत्तिक व सुंदर जोड घालून संसारांत गांजावून गेलेल्या मनास शांत आणि विशेषतः निष्काम कर्तव्याचरणास प्रवृत्त करणारा यासारखा दुसरा बालबोध ग्रंथ संस्कृतांतच काय पण जगांतील इतर वाङ्मयांतहि सांपडणें दुर्मिळ होय. केवळ काव्य व दृष्टीनें जरी याचें परीक्षण केलें, तरी आत्मज्ञानाच्या अनेक गहन सिद्धान्त प्रासादिक भाषेनें आबालवृद्धांस सुगम करणारा आणि ज्ञानयुक्त भक्तिरसानें भरलेला हा ग्रंथ उत्तम काव्यांत गणिला जाईल. मग सकल वैदिक धर्माचें सार श्रीभगवंतांचे वाणीनें ज्यांत सांठविलें गेलें त्याची योग्यता काय वर्णावी ! भारतीचें युद्ध समाप्त होऊन श्रीकृष्ण व अर्जुन प्रेमानें गोष्टी बोलत बसलें असतां भगवंतांचे मुखाचें गीता पुनः ऐकण्याच्या इच्छेनें अर्जुनानें एक दिवस श्रीकृष्णास अशी विनंति केली कीं, 'युद्धारंभीं तुम्ही केलेला उपदेश मी विसरलों; मला तो कृपा करून फिरून सांगा.' तेव्हां, "सदर उपदेश त्या प्रसंगीं अत्यंत योगयुक्त चित्तानें केला. असल्यामुळें तो पुनः, तसाच सांगणें मलाहि अशक्य आहे!" असें भगवंतांनीं स्पष्ट उत्तर दिलें, म्हणून अनुगीतेच्या आरंभीं म्हटलें आहे. (म. भा. आश्वमेध. अ. श्लो. १०–१३) वास्तविक पाहिलें तर, भगवंतांस अशक्य असें कांहींच नाहीं, पण त्यांनीं खुद्द गीता पुनः सांगणें अशक्य म्हणावें, यावरून गीतेची थोरवी केवढी मोठी आहे हें मात्र चांगलें व्यक्त होतें. वैदिकधर्मांतील भिन्नभिन्न संप्रदायांस वेदाप्रमाणें हा ग्रंथ आज सुमारें अडीच हजार वर्षें,–सर्वांस एकसारखाच-मान्य व प्रमाणभूत होऊन बसला आहे, यांतील बीजहि हेंच असून, याच कारणास्तव— (ओळी ३१)

सर्वोपनिषदो गावो दोग्धा गोपालनंदन : ।
पार्थो वत्सः सुधीर्भोक्ता दुग्धं गीतामृतं महत् ॥

Fig. 142. **Specimen of Tilak type as improved by N. C. Kelkar in 1926.**

The Tilak system of setting Devanagari type in linear fashion is graphically explained in the *Kesari* of January 3, 1931. The basis of this system was the elimination of full letters with the verti-bar from the fount and replacing them with half letters with separate *kānā* to be attached to them for making full letters. The half letters were to be used with the vowel-signs cast on the linear basis. Some of the peculiar combinations in

the system of setting, advocated by Lokmanya Tilak, are shown below :

Table 77 : **Tilak's suggestion for linear setting of Devanagari**

अ ा = आ	म् ा = मा	द्ध = द्ध
इ ी = ई	ह् ा = हा	क ् ष = क्ष
उ ु = ऊ	ह ३ = ह्ल	प ् फ = फ्फ
ए ॅ = ए	श्र ा = श्रा	त ् त = त्त
ए ै = ऐ	श्र ा = श्रा	क ् क = क्क
न ् न = न्न	प्र ा = प्रा	श्व ा = श्वा
त्र ा = त्रा	स ् न = स्न	क ् ू = कू
ट ॅ = ट	स्त्र ा = स्त्रा	
ट ् ल = ट्ल	द्य ा = द्या	

Lokmanya Tilak is the pioneer amongst the typographer script reformers and is responsible for the introduction of the linear setting method for the Devanagari. The fount introduced by him in 1904 modified by the improvements carried out in 1914 and again in 1926, is given in the table reproduced on pages 478 and 479

3. 'Madhup' in Masik Manoranjan (1914)[5]

The question of Devanagari script reforms was discussed by 'Madhup' in the monthly Magazine *Masik Manoranjan* in 1914. Madhup was criticizing Rev. J. Noels for advocating the replacement of the Indian scripts by the Roman script. Madhup discussed the inadequacies of the Roman script at length and then laid down four principles on which, according to him, the script reforms were to be based :

(1) Script reforms should not distort the script much.

(2) Composing should be possible by placing the types one after the other.

(3) Style of the script should be the same for writing and printing.

(4) The script so reformed should be capable of being adapted to the mechanical composition.

Madhup pointed out that the Roman alphabet was inadequate not only for Indian languages but even for English, as its use resulted in ambiguity as would be seen from the following possible pronunciations of the word City :

सिटि, किटि, सायटि, कायटि, सति, सिताय, किताय, सित्य, कित्य, सिटच, किटच

He quoted an authority on the perfection of Devanagari. "The Marathi possesses a perfect alphabet already and I trust that this will never be

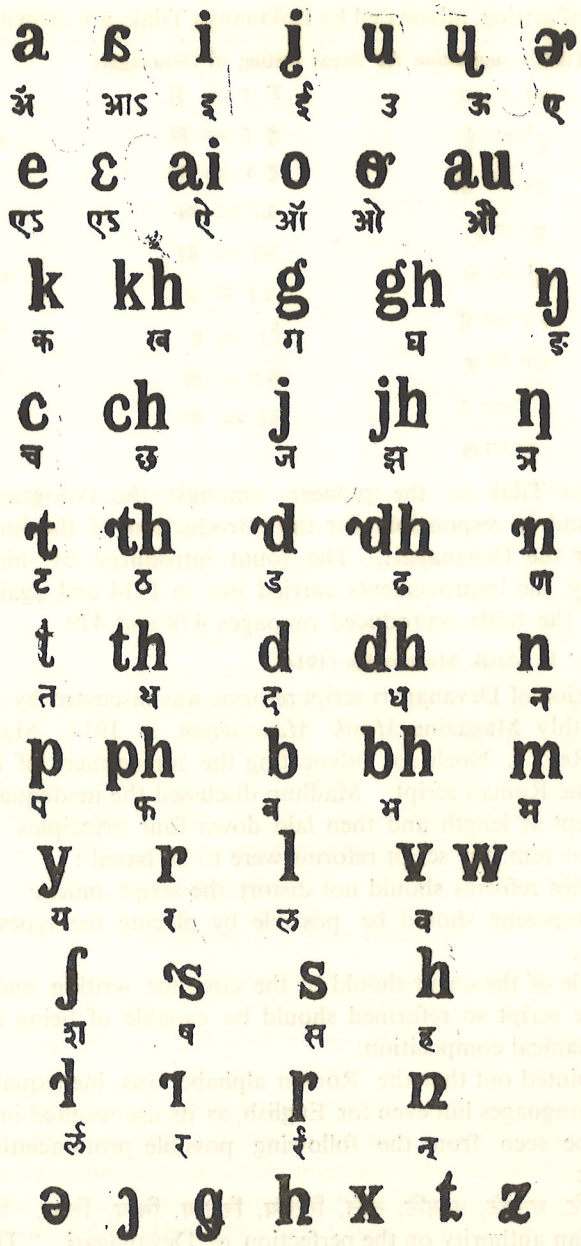

a ɐ i j u ų ɐ
अं आऽ इ ई उ ऊ ए
e ɛ ai o ɐ au
एऽ एऽ ऐ ऑ ओ औ
k kh g gh ŋ
क ख ग घ ङ
c ch j jh ɳ
च छ ज झ ञ
ʈ ʈh ɖ ɖh ɳ
ट ठ ड ढ ण
t th d dh n
त थ द ध न
p ph b bh m
प फ ब भ म
y r l v w
य र ल व
ʃ ʂ s h
श ष स ह
ɭ ɽ r ɳ
ळ ऱ ऋ न
ɘ ɟ g h x t z

Fig. 143. **Roman Alphabet for Indian languages suggested by Rev. Noels**

exchanged for an imperfect Romanised substitute." (Dr. Machican, Vice-Chancellor University of Bombay). Rev. Greeves has remarked that "Nagari has a good useful character easy to read and in every way adapted to the Hindi language." Rev. Noels had put up his own scheme (*Fig. 148* page 482) or a version of Roman script for use of Indian languages. Madhup discussed at length and discarded this suggestion.

Madhup was alive to the fact that Devanagari needed alteration in certain respects. His suggestions are enumerated below :

(1) It is necessary to provide symbols for the following phonemes :
Long आ as in F*a*r Short ए as in P*e*n
Long ए as in P*ai*n (पेऽन) and also इ ऽऽ, ऊ ऽऽ, ऑ and ओऽ

(2) The distinction in the Marathi and Sanskrit pronunciations of च, छ, ज and झ should be shown clearly by appropriate symbols.

(3) The distinction between accented conjunct ण्या in पुण्याय and the simple conjunct ण्या in पुण्याला; accented ल्या in कल्याण and ल्या in पिल्याचा; फ in फार and फ in फादर (father) need to be represented by appropriate symbols.

(4) Alteration in the design of ख to distinguish it from ख्व and also in the designs of घ and ध; य and थ is necessary to facilitate easy recognition.

(5) The written words should be capable of being read correctly by the reader who can recognise the letters i.e. उपयोग and not उप्योग; सम्जूत and not समजूत; कडक्वासलें and not खडकवासलें.

(6) The *Halant*-sign may be written after the first consonant in the conjuncts in the same line as in राज्‌य and not राज्य.

(7) The method of constructing conjuncts by splitting and joining two or more consonant-graphemes is responsible for the increase in types required for setting the Devanagari. This method needs revision particularly with a view to promote literacy.

(8) The method of joining vowel-signs to the consonants should be simplified. (Madhup indicates *degree* in the current method of three-step setting by the word *Mukā* (dumb type.)

Madhup, however, admitted that the script should not be altered to such an extent that those who learn it may be unable to read the books printed in the old style.

[The editor of *Manoranjan* recorded a note on these articles wherein he paid a tribute to Prof. Shankarrao Bhise, who took great interest in the script reforms. He had introduced Bhiso-type. It was not clear to me who was the real author of the articles published under the name of 'Madhup'. Y. R. Date suggested that he may be Bhise. It is now revealed that it was K. K. Gokhale whose article on Reformed Devanagari

is summarised at pages 493-495. The editor of *Masik Manoranjan* hoped that it would be possible to instal a Devanagari Linotype machine during his lifetime. He added that it was necessary to simplify the conjunct forms and set up the letters in the full body size one after the other. In the discussion that followed various writers put up their suggestions on this subject which were published in subsequent issues of the *Masik Manoranjan*].

4. Vinayak Shrikrishna Gharpure (1915)[6]

Gharpure set down the peculiarities of the Devanagari script as under :

(1) The Devanagari script is not a running hand. Except in case of ten letters the writer has to lift his hand.

(2) The letters with a *kānā* can be split up for writing or set up in the spelling method as the Roman script.

(3) Almost all the vowels change their forms in combination but the *kānā* representing presence of vowel अ remains in full form on the right, as in ग and in the middle as in क except in case of few letters like ट, ठ etc.

(4) The vowels except अ and आ take the shape of *velānti* on left or right, *mātrā* on the top and *ukār* at the bottom.

(5) The head-line is essential as it connects the vowels with the consonants.

The suggestions of Gharpure in respect of the changes in the script are summarised below :

(1) The conjuncts may be constructed by placing the consonants one after the other and dropping the verti-bar except that of the last.

(2) In case of the consonants without the verti-bar the absence of the vowel अ may be indicated by using *halant*, or the *halant*-sign, *before* the said consonant and not below it.

(3) The letters क and फ with the verti-bar centrally positioned may be made into half forms by removing a small portion on the right क and फ. They may be provided with a *kānā* to complete the letters with vowel अ i.e. क + अ(ा) = का ; फ + अ(ा) = फा.

(4) The similarity between the letter ख and the letters रव may be removed by constructing the letter ख in two types, i.e. ख and ा in which first half is made of र and ठ.

(5) The compounds क्ष and ज्ञ may be replaced, as they can be written in the conjunct forms of क् + ष = क्ष or ख्ष and द्+न् + न = द्न्न or ज् + ञ = ज्ञ. The Hindi pronunciation of ज्ञ is ग्न.

(6) The conjuncts of the letters without verti-bar written with *halant* may be written before the half consonant. It would be better still to provide verti-bar to letters like छ, ट, ठ etc.

(7) The letter ल may be written in its Hindi style ल.

(8) The letter-forms य थ घ ध may be retained as they are.

(9) All the five forms of र, may be continued to be used as र्, ◌्र, ◌्र, न, ◌्र .

(10) The following vowel-signs may be adopted इइ for ई; ◌ू for ऊ ; ऋ for ऋ ; ॠ for ॠ ; ए for े ; अई for ऐ; अऊ for ओ ; ॐ or ा◌ॅ for औ ; ◌ँ for *anuswar* and ◌ं for *anunasik*. Thus the word दौत will be written as दऊत and the word कौल as कऊल.

ऋ and ॠ in half forms may be used while joining with letters with *kānā* of which *kānā* is removed. They may be used in full form while joining with letters without *kānā*. Thus the *Barakhadi* would be :

अ	आ	इ	ई	उ	ऊ	ऋ	ॠ	ए	ऐ	ओ	औ	अं	अः
अ	आ	इ	इइ	◌ु	◌ू	◌ृ	◌ॄ	ए	अइ	अऊ	ॐ	◌ँ	अः
का	काा	कइ	कइइ	कु	कू	कृ	कॄ	कए	काइ	काऊ	कॐ	कां	काः

(11) The special sounds in foreign languages अॅ, आॅ, and *e* may be written as ऍ, ◌ॅ, and ◌े i.e. by lateral reversal of अ आ and ए

(12) The special pronunciations of च छ ज and झ in Marathi may be shown by placing a *nuktā* under them.

5. P. B. Kale (1914)[7]

P. B. Kale* agreed with Madhup in his suggestion regarding the consrtuction of conjuncts ; but made a revolutionary suggestion in the writing of the vowel-signs. Instead of *mātrās* going on the top and *ukārs* at the bottom, he proposed that they may be placed after the consonants in the same line. His scheme is reproduced overleaf. Kale also suggested that special signs may be provided for the dental pronunciation of च, छ, ज and झ.

6. Kashinath Waman Lele (1914)[8]

Lele supported Madhup in his criticism of the Roman script. He pointed out that a small sentence तो दादर चढला, if transcribed in the current Roman, would take the form "*To dadar chadhala*" and can be pronounced in thirty-two different ways as under :

To = टो, तो, टु, तु.

Dadar = दादर, ददर, दादार, ददार, डादर, डदर, डादार, डदार, दाडर, दडर, दाडार, दडार,

Chadhala = चढला, चाढला, चढाला, चाढाला, चढल, चाढल, चढाल, चाढाल, चधला, चाधला, चधाला, चाधाला, चधल, चाधल, चधाल, चाधाल.

*See pages 557 to 560 for Kale's recent proposal.

A. Vowels अ आ इ ई उ ऊ ऋ ए ऐ ओ औ अं अः

B. Vowel-signs

C. Some more signs { रेफ चंद्र पायमोड

D. Specimen setting कांहीं नमुन्यादाखल शब्द.

आतां मराठी खिळ्यांत फरक शिक्षणाच्या वाढी-

साठीं व वाङ्मय स्वस्त करण्यासाठीं केलाच पाहिजे !

पूर्वी बँड गृहलक्ष्मी सूर्यफूल तोंड

मनोरंजन इलेक्ट्रिक लायनो टाइप प्रेस.

Fig. 144. **Specimen types according to Kale's suggestion**

Lele made the following suggestions :

(1) The *halant*-sign when used should indicate crossing of the verti-bar. It should at least, therefore, touch the verti-bar. The suggestion of placing *halant*-sign after the full consonant, to denote absence of "अ" in letters having verti-bar, will consume much space. Half letters may, therefore, be used by removing the verti-bar.

(2) The small top joint of the letters without verti-bar ङ, ट, ठ, ड, ढ, द, ह, may be dropped when they are to be used as first letters in conjuncts ङ, ट, ठ, ड, ढ, द, ह. In the alternative, they may be used with the *halant*-sign. In that case it would be necessary to cast separate types with the *halant*-sign at least for द and ह, as placing of the *halant*-sign below them would be difficult in view of the longer descenders.

(3) Vertical stroke with *halant*-sign ् and the vertical stroke with ऋ vowel-sign ृ may be used, dispensing with several *akhand* letters such as न् न् etc. These half-letter forms and conjuncts can be made as न्+् = न् and न्+ृ = नृ. द् and ह् may be written as दऋ and हऋ (ऋ is not usually joined to ङ ट ठ ड and ढ).

(4) It is wrong to place the *anuswār* on the top of the letters as the order of pronunciation is from left to right and top to bottom. The nasal can be indicated by using *parasa-varna* as in द्म्पती for दंपती. In case where the dot, *anuswār*, is necessary, it should be placed with head-line after the letter, as in पाँच for पांच.

(5) The vowel signs for उ, ऊ, इ, ई, ए, ऐ, ओ, औ, may be placed after the consonants as in the *Fig.* 145 above as was the practice in case of स ज्ञ क्ष and ज्ञ and still current in रु and रू.

(6) The accented र may be represented by ऱ, thus सर्व for सर्व.

(7) The vowels except ऋ ॠ, ऌ and ॡ may be represented by joining the vowel signs with अ i.e. अि, अी, अु, अू, अे and अै. (Actually the vowel-signs are to be placed after the letter अ.).

Fig. 145. **Vowel-signs suggested by Lele**

(8) The set-size of letters may be standardised by groups.

wide = अ क फ, normal = न व प, narrow = र

Owing to the absence of any standardisation in this respect currently the *degrees* are not properly justified.

Table 78 : **Fount of 125 types suggested by Lele**

Vowels	अ ऋ ॠ ऌ ॡ ॐ	6
Vowel-signs	(for design *see Fig.* 145 above.)	19
Consonants	क ख ग घ ङ च छ ज झ ट ठ ड ढ ण त थ द ध न प फ ब भ म य न ल व श ष स ह ळ क्ष ज्ञ	35
Half Consonants	क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण त थ द ध न प फ ब भ म ट ठ ल ठ श ष स ह ळ क्ष	35
Figures	१ २ ३ ४ ५ ६ ७ ८ ९ ०	10
Signs	, ; . ? ! । ॥ ' ( ) - –	12
Spaces, leaders, etc.		8
		125

Lele stated that in his fount the x-height would be more in relation to the existing founts of the same body and the present 12 pt. face can be cast on 6 pt. body. Lele had with him matrices and punches of English-body face, for casting on 7 pt. body and Long-primer face on 5 pt. body. Lele claimed that the use of his type would make it possible to accommodate fifty percent more matter in the same space.

आजची टी=ट्इ; टु=टु; टे=टे; डे=डे; आहे=आहे;
जिकडे तिकडे = ज्इकडे त्इकडे; चंद्र=चंद्र; ह्या=ह्या;
द्या=द्या; अद्भुत=अद्भुत; द्ध=द्ध; दीक्षित=दइक्षित अि.

Fig. 146. **Suggestion of Lele (as quoted by Br. Savarkar)**

7. Jaoji Dadaji Type Foundry (1916)[9]

The famous Nirnaya-sagar Type Foundry of Bombay which was responsible for the introduction of the classical Devanagari face, made some experiments on the script reforms with the help of Lele Shastri and actually got the punches cut from Ranoji Ravaji Aru. The total sorts in this fount are only 105–110. The vowel-signs in the new style are shown hereunder with the *Barakhadi* of न.

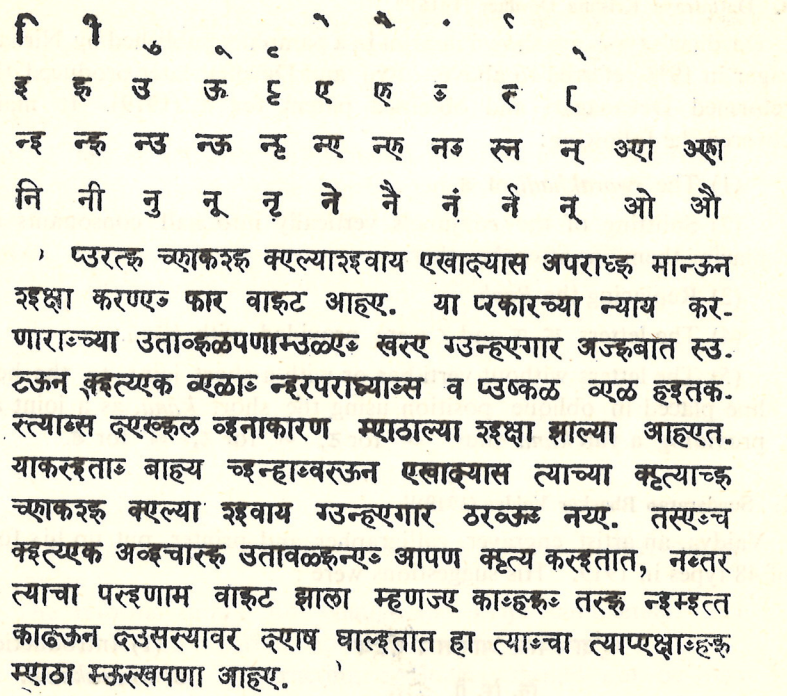


Fig. 147. **Specimen of the linear design of Devanagari cut by Ranoji Aru**

The matter set above in the Nirnaya-sagar linear type is transliterated below in the conventional Devanagari type (Mono) :

पुरती चौकशी केल्याशिवाय एखाद्यास अपराधी मानून शिक्षा करणे फार वाईट आहे. या प्रकारच्या न्याय करणारांच्या उतावळीपणामुळे खरे गुन्हेगार अजिबात सुटून कित्येक वेळा निरपराध्यास व पुष्कळ वेळ हितकर्त्यांस देखील विनाकारण मोठाल्या शिक्षा झाल्या आहेत. याकरिता बाह्य चिन्हावरून एखाद्यास त्यांच्या कृत्याची चौकशी केल्याशिवाय गुन्हेगार ठरवू नये. तसेच कित्येक अविचारी उतावळीने आपण कृत्य करितात, नंतर त्याचा परिणाम वाईट झाला म्हणजे काही तरी निमित्त काढून दुसऱ्यावर दोष घालितात हा त्यांचा त्यापेक्षाही मोठा मूर्खपणा आहे.

Tukaram Javaji, the proprietor of Jaoji Dadaji Type Foundry has claimed in the note attached to this pamphlet that the new type is useful and convenient. He further states that it is not necessary to cast several types of the same letters; it would suffice to cut only the full letter and half letter and that there are no *degrees* to spring up or to fall out.

8. Dattatraya Krishna Devdhar (1916)[10]

Devdhar's types are shown in print in a pamphlet published by Nirnaya-sagar in 1916 referred to above. Aru and Devdhar later produced their reformed Devanagari and obtained patent for it (1919). It mainly covered the following:

(1) The *swarakhadi* of अ.

(2) Splitting of the conjuncts vertically into half consonants and placing them one after the other.

(3) Replacing the *Reph* ˚ .

(4) The letters क, फ and र were provided with *kānā*.

(5) The letters without verti-bar or with a short joint to the head-line placed in oblique position using the short *kānā*, as a joint and providing a full *kānā* thus ल for ट, ळ for ठ, ख for ड.

9. Sundararao Bhaskar Vaidya (1919)[11]

Vaidya, an artist, engraver, calligrapher and printer, put up his fount of 48 types in 1919. His suggestions were :

सुंदरराव भास्कर वैद्य

बि. बि. सी.

लिनोटाइप

छापण्याकरितां लागणारें कोणतेंही काम तयार करण्यांत येतें.

जसें:—१ बुडा ब्लॉक्स-हो लांकडावर कोरले जातात.

२ मेटल ब्लॉक्स-हो लांकडाप्रमाणेंच यापैकि मेटलवर कोरले जातात. हो लांकडासारखेंच टिकून यांस किंमत लांकडापेक्षां कमी पडते.

३ स्टीरीयो-हो वरील कोरलेल्या ब्लाक्सवरून तयार करितात. जेव्हां किंमतीच्या पुष्कळ प्रती पाहिजे असतात तेव्हां स्टीरीयो तयार करून घ्यावे. हो कींमतीनें पुष्कळ स्वस्त पडतात.

Fig. 148. **Specimen of the types designed by Sundararao Bhaskar Vaidya**

(1) Introduction of *Swarakhadi.*

(2) Providing verti-bar to all letters.

(3) Splitting of conjuncts.

(4) Placing the short इ vowel-sign after the consonant.

(5) Removing the joint to head-line and providing full *kānā* to letters ठठ etc.

10. B. R. Shitut[12]

Shitut supported Devdhar-Aru, but emphasised that the letter with short bar may be turned horizontally and provided with a full verti-bar. Thus ड may be written as ळ, ट as ल

11. Y. M. Nanal[13]

Nanal of Thana supported Devdhar-Aru but suggested that *halanta* might be retained. Similarly the *Ardha-chandra* and *Reph* may also be used. He states that the *Reph* is particularly necessary to distinguish between the pronunciation between द्र्या, दर्या ; कान्यास, कार्यास etc. He recommended dropping of the short-bar from letters ङ, छ, ट, ठ, ड, ढ, ह and ळ, for use in conjuncts. Similarly a verti-bar may be provided to क, फ, ऱ and ल . *Mātrās*, *ukārs* etc. may be cast with the short-bar also. Separate types may be cast for *anuswār*, *rafār*, *visarga* and *chandra*. A complete fount according to Nanal, will thus consist of 83 types: 26 vowel-signs, 10 figures, 12 punctuation marks, 34 half consonants and 1 half-vowel.

12. Wasudeo Dhondo Joshi[14]

Joshi of Khanapur-Belgaum laid down the principles underlying his suggestions as :

(*a*) The reforms should not change the script completely. The method of vowel combination should not be very different.

(*b*) The method of constructing conjuncts should not be very different.

(*c*) The number of types required for setting should be reduced to the minimum from the current requirement of 300.

(*d*) The method of linear setting should be adopted for Devanagari. Specific suggestions put forth by him are :

(1) The type of vowel अ should be without verti-bar ऊ which can be used for अं and even for इ, ई, उ, ऊ, ए and ऐ, ओ, औ, ओ and औ.

(2) The short इ vowel-sign ि may be written in the *Modi* style by shortening the verti-bar.

(3) The vowel-signs for उ and ऊ, ऋ and ॠ may be cast with verti-bar ु, ू, ृ and ॄ. Similarly the *mātrā*-signs ॅ ॆ and ॅ etc. may also be cast with verti-bar ॅ, ॆ, ॅ etc.

(4) The vowel ऌ may be written with ल and ृ i.e. लृ.

(5) The consonants may be cast without verti-bar so that they can be used for conjuncts and the vowel-signs with verti-bar can be joined to them to make full letters.

(6) The letters without verti-bar ङ, छ, ट, ठ, ड, ढ, द, र, ह and ळ may be considered half letters and a verti-bar may be provided to complete them, i.e. ङ्न, छ्न, ट्न, ठ्न, ड्न, ढ्न, द्न etc.

(7) The letter क्ष may be written as क्ष, ज्ञ may be retained.

(8) All the three forms of र, i.e. ऱ्हास, कार्य and राष्ट्र may be written in *Modi* style using half र (ɾ.)

(9) The vowel-sign of अ, verti-bar ा may also be cast with *halant* ् for use of last half letters in words, i.e. अनुष्टुप् .

(10) The letters ॐ and श्री may be provided in full form.

The reformed fount will be composed of the following letters and signs :

Table 79 : **Fount of 59 types suggested by Joshi**

ऊ ऽ ा ि ी ु ू े ै ृ ॄ ँ ं 22

ॅ ॉ ॊ ् ़ ॅ ॉ ॄ ॅं

क ख ग घ ङ च छ ज झ ञ ट ठ ड ढ ण

त थ द ध न प फ ब भ म

य र ल व श ष स ह ळ इ. श्री. ॐ 37

Joshi made another suggestion to replace the *mahāprāṇ* consonants ख, घ, छ, झ, ठ, ढ, थ, ध, फ and भ with the *alpaprāṇ* consonants suffixed with ह i.e. ख = क्ह, घ = ग्ह, ठ = ट्ह, ध = द्ह and so on.

13. Mahadev Rajaram Bodas (1926)[15]

Bodas discussed the Devanagari reforms in an article published in 1926. He described the Devanagari script as a scientific alphabet having phonetic letters. He cited the characteristics of Devanagari as (*a*) combination of consonants with vowel-signs and (*b*) the method of writing from left to right. Bodas stated that the practice of writing the *Bārākhadi* or the consonant-combinations with twelve vowel-signs was introduced by the Buddhists. His contention is based on the fact that before learning the alphabet the students are required to bow to the Buddha.

ॐ नमः सिद्धं currupted to ओ ना मा सि ध म्.

Bodas made the following definite suggestions :

(1) Head-line may be dispensed with.

(2) *Anuswār* (simple nasalization) *anunāsik* (simple nasalization of the vowel or *ardha-chandra*) and nasals in combination, may be represented by the *anuswār*.

(3) The consonant types may be cast in half forms for conjuncts.

(4) The vowel 'ऌ' and consonants 'ङ' 'ञ' 'ळ' may be dispensed with.

14. Krishnaji Keshav Gokhale (1927)[16]

K. K. Gokhale was a close friend of the Marathi novelist Hari Narayan Apte, and was himself a novelist and a writer. He came across the articles of Rev. Noels, published in the *Times of India* and got interested in Devanagari script. Gokhale was working as the Jail Superintendent in the princely State of Jat. A printing press was then installed in the State Jail. Shitut head-master of the local secondary school learnt composing and joined Gokhale in the discussions on script reforms. Gokhale was the first script reformer to start discussion on this subject. His articles were published in *Masik Manoranjan* under the name 'Madhup' and are summarised on pages 481-3. Gokhale thought of adopting the overhanging method used for Italic types, for the *Mātrās* and *Ukārs* in Devanagari. He experimented with cardboard models. With the active co-operation of Wamanrao Patwardhan of the Aryabhushan Press he got a complete fount made and obtained a patent for it. He approached late Sir Raghunath Paranjape, the then Education Minister, who agreed to obtain the opinion of the Government Central Press authorities. Gokhale did not however get a satisfactory reply. He continued to experiment. Type matter set up in the type cast by the Aryabhushan Press, was then being published in the *Daily Dnyanprakash* every day. Gokhale approached the Monotype Corporation with his scheme of overhanging types. Initially the Corporation hesitated, as a previous attempt in adopting Devanagari to the Monotype Machine had failed. Ultimately they agreed and a fount was made. The types were sent down to Gokhale and he approved them. He entered into an agreement with the company whereby he was to receive ten percent royalty on the Devanagari equipment sold by the Corporation. No progress was however made as Mr. Dunkan who was looking after this work expired. In the meanwhile the Aryabhushan Press was burnt in the fire that broke out in 1927 and the fount of type made there according to the scheme of Gokhale was destroyed. Gokhale was disappointed but not discouraged. He now gave up his original idea of overhanging characters as the overhangs used to breck and the type soon became useless. He however firmly believed that the only script that could cater to the needs of all the Indian languages was Devanagari and therefore pleaded for its simplification.

Gokhale entered in the discussion of the Devanagari script reforms with his contribution to the *Masik Manoranjan* in 1914, as stated above. The history of his experiment is narrated by him in a paper which he

submitted to the Twelfth Session of the Maharashtra Sahitya Sammelan, held at Poona in 1927. He also suggested a new scheme in another paper submitted to the same session :

(1) His principal recommendation was to place the vowel-signs after the consonants as under :

		Current Method	*Gokhale's suggestion*
Short i *ie.*	f	चिमी	चि मी
Long ī *ie*	ी		
Short u *ie*	ु	मुलुख	म लूख
Long ū *ie*	ू		
Short e *ie.*	े	पे, पै,	पे पै
ai *ie.*	ै		
Anuswāra	पं		पं
R̥ kar (ऋकार)	पृ		पृ
Halant	प्		प्

(2) The conjants of verti-bar letters may be made in the lienear method.

(3) The conjants of short-bar and middle-bar letters may be made by using *halant* i.e. द्राक्ष=द्राक्ष; ड्राम=ड्राम; सिद्ध=सिद्ध.

(4) The conjants of र may also be constructed in the same way. i.e. मर्म=मर्म; कर्म=कर्म; प्रेम=प्रेम; त्रास=त्रास.

(5) The fount of types recommended by Gokhale would be as under:

Table 80 **Gokhale's Devanagari fount**

Vowels :	अ, इ, उ, ए ;	.. 4
Consonants :	क, ख, ग, घ ; च, छ, ज, झ, ञ	
	ट, ठ, ड, ढ, ण ; त, थ, द, ध, न	
	प, फ, ब, भ, म ;	
	य, र, ल, व, श, ष, स, ह, ळ	.. 33
Vowel-signs :	ा, ि, ी, ु, ू, ृ, े, ै, ॅ, ॆ, ॅ, ॅ,	
	ं, ः, ; , े for pen पेन	.. 13
Figures, Punctuation Marks and Signs		.. 25
		75

(6) The vowels ई, ऊ, ऋ and ऌ may be set up as under :

ई=इॅ ; ऊ=उॅ ; ऋ=अ ृ ऌ=ल ृ.

(7) क्ष and ज्ञ may be written as क् ष ; ज्ञ.

(8) Gokhale suggested that types can be cast with combination of *Mātrās* such as ा, ां, ाः, etc. Similarly words occurring frequently can also be provided in the upper case.

(9) Gokhale suggested further reduction in the letters by dropping the त *varga* and the aspirated letters, i.e. ख, घ, झ, etc.

(10) Long vowels may be indicated by duplicating the short vowel sign, i.e. ई=ff ; ऊ=ु, ु,.

Gokhale considered various script reforms suggested till 1927 and expressed his preference as under :

(1) The head-line may be dropped as the speed of writing will increase and there will be saving of ink in printing.

(2) The *Bārākhadi* of अ may be accepted.

(3) The aspirate ख, छ, ठ, थ, फ, घ, झ, ढ, ध, म may be indicated by a sign, i.e. ख=क ै, छ=च ै,

(4) The distinction in the letters रव and ख, घ and ध, य and थ, म and भ may be made clear by re-designing the loop.

(5) The short-bar and middle-bar letters : क, छ, ट, ठ, ड, ढ, द, फ, र, ल, ह, ळ may be used with *halant* in (्) conjants.

(6) क्ष and ज्ञ may be dropped in preference to क्ष and ज्ञ.

(7) ऽ may be used in preference to श or ष.

(8) No distinction may be made in writing र् in आचार्याने and आचा-याने.

15. Wasudeo Dhondo Gurjar (1929)[17]

Gurjar of Aundh, district Satara, in a paper "The principal drawbacks of the Devanagari Script" published on the occasion of the Marathi Literary Conference held at Belgaum in 1929 enumerated the drawbacks of the Devanagari script as :

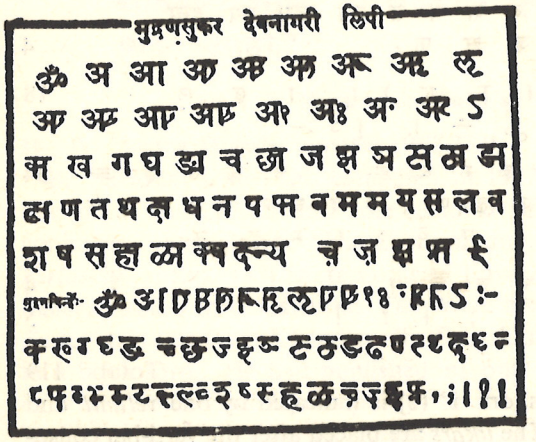


Fig. 149. **Gurjar's Devanagari**

(1) the practice of placing vowel-signs at the top and at the bottom of the consonants and

(2) the method of constructing conjunctions.

He laid down some principles for the script reform:

(1) The reformed script should not be much different from the current script.
(2) The distinct quality of Devanagari should be retained.
(3) The script should be easily recognisable (*Bālbodha*).
(4) The characters in the script should be reduced to the minimum.
(5) It should be possible to construct consonants by setting two types.

In his note submitted to the Kalelkar Committee of the Constituent Assembly Gurjar observed[18] that :—

(*a*) All the vowels may be indicated by adding the vowel-marks to the basic vowel indicator (स्वराधार).
(*b*) All the vowel marks may be placed after the letter.
(*c*) The letters without verti-bar may be provided with a verti-bar.
(*d*) The *Reph* (ˊ) may be represented by *halant* ्र.

Gurjar's reforms were thus based on providing a full verti-bar to the characters without verti-bar, such as छ, ट, ठ adding verti-bar to half forms of क and फ (का फा) and accepting the *Swarākhadi* as अि, अी, अु, अू, अे, अै. His fount would be as under :

Table 81 : **Fount of 119 types suggested by Gurjar.**

Vowels :	ॐ, अ, आ, अ॰, अ॰, अ॰, अ॰, अ॰, ऌ, अ॰, अ आ॰ आ॰ अ॰ अ॰ अ॰ अ ऽ	18
Consonants :	का, ख, ग, घ, ङ॰, च छ॰ ज झ ञ ट ठ ड ढ ण त थ द॰ ध न प फ ब भ म य र ल व श ष स ह॰ ळ॰, क्ष द॰	35
Nukta letters :	च़ ज़ झ़ फ़	4
Vowel-signs :	ॐ, अ॰ ा ॅ ॅ ॅ॰ ॅ॰ ॅ ॅ ॅ॰ ॅ॰ ॅ॰॰ ॅ॰॰ ॅ॰ ॅ॰ ॅ ऽ :—	18
Half consonants :	क ख ग घ ङ॰ च छ ज झ ञ ट ठ ड ढ ण त॰ थ द ध न॰ प फ ब भ म य॰ ए॰ ए॰ व॰ श॰ ष॰ स॰ ह॰ ळ॰	34
Nukta Half letters :	च॰ ज॰ झ॰ फ॰	4
Punctuation marks :	, ; । ? !	5
	Total	119

In the above scheme the short 'i' (इ) is indicated by one *velānti* and long 'i' (ई) by two *velāntis*. The *ukārs* are placed after the verti-bar consonants as is done in case of 'रु' and 'रू'. These vowel-marks are placed after the consonants in the same line. Gurjar advocates the introduction of the Bengali system of indicating the *Anuswār* in 'संसार' etc. i.e. 'सन्सार'. For *Anunāsik* the present *Anuswār* sign may be used, but it may be placed in the same line. The *visarga* sign in his scheme is different from colon, in that two dots are replaced by two zeros. The half-moon-sign is to be placed after the consonant. The letters without verti-bar or with short *kānā* 'छ ट ह ळ' etc. are to be provided with verti-bar. Their half forms are to be cast with a joining line as 'ट॰ ह॰ ळ॰. The letter र is altered by placing the vertical upper half in horizontal position and adding a *kānā* thus 'त'. The vowel signs are cast with *kānā* so that by joining them with half consonants, full letters can be made. The full point (.) is replaced by *charan regh* (।). The *avagrih*-sign ऽ is provided in order to indicate the long 'e' (ए) phoneme in Kannada and other languages of the South. *Reph* is to be represented by 'ˊ' in the same line but before the character and not above it as 'धˊम for धर्म'.

Gurjar, writing earlier from Khanapur-Belgaum, had advocated the use of "ह" for the aspirated consonants, i.e. ख=कह, घ=गह, छ=चह. He admits that this suggestion is based on English spelling, but recommends it and applies it to ten types in the fount.

डॉक्टर ब्हिसे हे गृहनस्त्हन कै. गोकह्नले यांच्या सल्ल्यानें हिंदुस्त्हानांतून अमेपिकेंत गेले. तेत्हें त्यांनीं ॲटोमिडाआिन हा पदान्त्हन शोदत्हनून काडत्हला आहे. या बदद्दल हिंदनूनां अब्हिमान बाटत आहे."

Fig. 150. **Extract from Gurjar's article in Lokamitra[19]**

16. Br. Vinayak Damodar Savarkar (1927-37)[20]

Br. Savarkar joined this campaign in 1927 with a brief for the introduction of *Swarākhadi* and the removal of verti-bar for constructing conjuncts, through the *Shraddhānanda* and later the monthlies of the *Kirloskar* group. Gadre reproduced Savarkar's articles in *Shrikrishna Sandesh* issued from Calcutta. They were also reproduced by Agarkar in *Swarajya* issued from Khandva. Br. Savarkar later published the articles in a book form. He had published in one of his articles an opinion of Vasudevrao Gandhi, compositor at the Government Central Press, Bombay, to prove that the method of setting Devanagari advocated by him did not require more time.

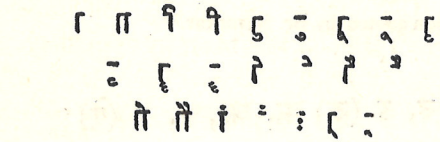
'अ' च्या बाराखडीचा पाहली प्रसाद बॅ. सावरकर यांच्या मुलीलाच मिळतो.

ती गंमत अशी. नगरपालिकेच्या मुलींच्या प्राथमिक शाळेंत माझी मुलगी कुमारी प्रभात ज्या वर्गांत शिकत होती तींत तिच्यासह दोनचार मुली 'अ'ची बाराखडी लिहीत. त्यांना त्यांच्या शिक्षकिणीनें पुष्कळ वेळां तसें न लिहिण्याम सांगितलें. मीं सांगितल्याप्रमाणें त्यांनीं अुत्तरानें कों 'बाअी आमच्या पालकांनीं असेंच लिहिण्यास सांगितलें आहे. ही चूक असेल तर तुम्ही आमचे तितके गुण कापा.' त्याप्रमाणें बाअींनीं अनेक वेळां त्यांचे गुण कापावे. तेवढ्यानें भागेना तेव्हां दोन तीनदां त्या बाअीनें त्या लहान मुलींना अुभे राहण्याची शिक्षाही दिली. पण त्यांनीं पुन्हां 'अ'ची बाराखडीच शुद्धलेखनांत वापरलेली पाहून बाअी अगदींच संतापल्या आणि अितर मुलींना सोडून सहा सात वर्षांच्या माझ्या मुलीलाच पुढें बोलावून दोनचार चापट्या फाडफाड मारल्या. ती रडूं लागली. तेव्हां वर्गांतल्या साऱ्या लहान मुलींनीं त्या बाअीभोंवतीं घोळक्यानें जमून किलबिलाट केला कीं 'तुम्ही सावरकरला मारलेंत काय म्हणून!' हा गोंधळ पाहून मुख्याध्यापिका बाअीही आल्या. माझ्याच मुलीला मारलेलें पाहून त्या चपापल्या. आणि बाअीला बाजूस नेऊन म्हणाल्या, 'लहान मुलींना सहसा शारीरिक शिक्षा करावयाची नसते. त्यांत ती सावरकरांची मुलगी. हें पकरण वाढलें, तर मला निस्तरावें लागेल! तूं मुलीला माझ्याकडे कां आणले नाहींस?' बिचारी बाअी. तीही घाबरली. अिकडे कु. प्रभात शाळेंतून तडक घरीं आली आणि गाऱ्हाणें मला सांगितलें. मी तिला समजावून दुपारीं पुन्हा वेळेवर शाळेंत धाडलें. तिच्या हातीं मुख्याध्यापिकेला अेक चिटूठी दिली कीं, "ज्या मुली नवीन लिपि लिहितात त्या पालकांच्या आग्रहानें लिहितात. दोषच असेल तर तो पालकांचा, मुलींचा नव्हे. तथापि

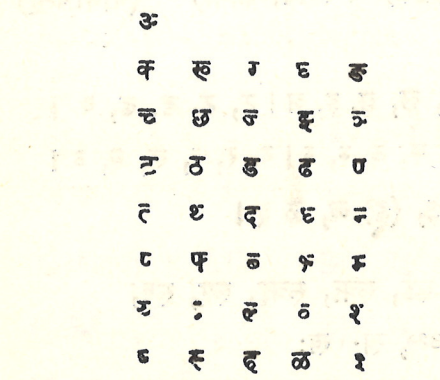
Fig. 151. **Specimen of Vaidya type recommended by Br. Savarkar**[21]

लिपिशुद्धीच्या मूळाक्षरांचे ठोका

स्वरचिन्हें



अक्षरें



टीप—शेंडीवाल्या छ, ट, ठ, प्रभृतींचीं व्यंजनरूपें जोडाक्षरादिस्थानीं पायमोड चिन्हानें साधतात. जसें 'ट्या' 'ठ्या'

Fig. 152. **Vaidya type-fount supported by Br. Savarkar**[22]

Savarkar mainly recommended the suggestions of Vaidya. They were :

(1) The vowels इ ई उ ऊ ऋ ॠ ए and ऐ may be replaced by the *Swarākhadi* i.e. अि अी अु अू अृ अॄ अे and अै.

(2) Conjuncts may be split up and written in half letter forms.

(3) Half consonants may be indicated by removing the *kānā*.

(4) *Kānā* may be provided to क फ र ल i.e. का फा ना ला.

(5) *Kānā* may also be provided to the letters छ, ट, ठ, etc. and their half forms may be indicated by removing the verti-bar.

(6) The distinction in the following forms may be clear from the context:

with accent

(*i*) मध्यास (at the centre)
(*ii*) काऱ्यास (कार्यास) for work

without accent

(*i*) मध्यास (to Madhu)
(*ii*) काऱ्यास (to *kārā*)

The accented form may be written as काऱ्यास.

(7) The half forms of ट ठ etc. can also be indicated by using the *halant*-sign.

Commenting on Nanal's reference to the necessity of distinction in the forms of र to represent the distinct pronunciations, Br. Savarkar quoted similar pronunciations, i.e. सत्या plural of सती and सत्यास (to the truth) मध्यावर (on Madhu) and मद्ध्यावर (at the centre).